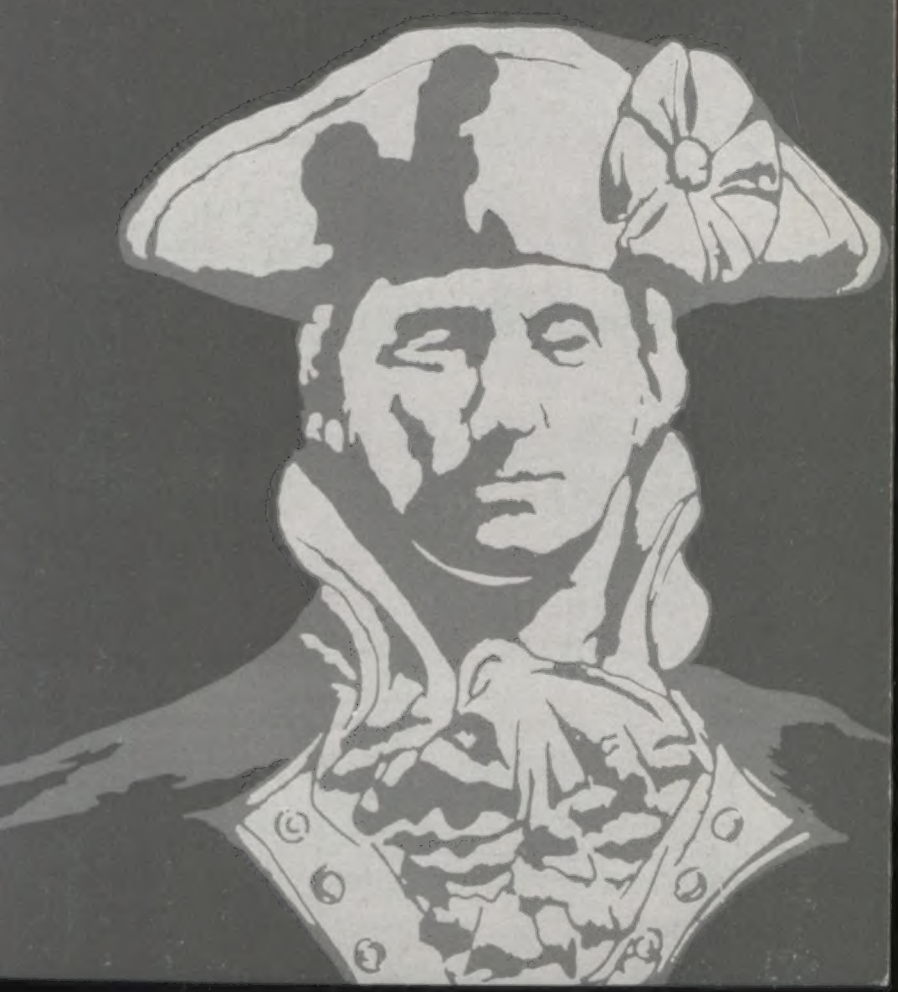
e George Washington University Bulletin

Undergraduate and Graduate Programs

1985–1986





THE GEORGE WASHINGTON UNIVERSITY CAMPUS/WASHINGTON, D.C.

THE GEORGE WASHINGTON UNIVERSITY BULLETIN

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THE GEORGE WASHINGTON UNIVERSITY BULLETIN

UNDERGRADUATE AND GRADUATE PROGRAMS
1985–1986

Columbian College of Arts and Sciences

Graduate School of Arts and Sciences

School of Education and Human Development

School of Government and Business Administration

School of Public and International Affairs

Division of Continuing Education and Summer Sessions

For information concerning the School of Engineering and Applied Science, the National Law Center, or the School of Medicine and Health Sciences, please request the appropriate bulletin.

UNIVERSITIES are undergoing change, either drastically or slo as they have been for centuries. Whatever the changes, the one pre on which universities are based remains constant: universities are learning—for acquiring learning, for transmitting learning, and for exploration that yields new learning. Any other objective is unwo of a university, and any other purpose is incompatible with the interests of students and their relationship to the institution.

The faculty, through scholarship and research, extends learning, an transmits learning by teaching. Students learn from the faculty, library, and the laboratory—if they accept, as they must, learning their objective. This learning does not take place in a vacuum; addition to the particular content of learning, students will deve certain habits of mind—analytical thinking, powers of insight, s examination, and the use of rational discourse—that will serve th throughout their personal and professional lives.

Within this basic context, George Washington University invites s dents to take up their residence in order that their energies, interes and talents may be directed to learning.

Exceptional opportunities for learning are made possible because of t University's location in the heart of the nation's capital. For examp cooperative programs are conducted in various fields of study wi members of Congress, the Smithsonian Institution, the Library Congress, the National Gallery of Art, and other federal and priva organizations. In addition to these programs, Washington presen opportunities for observation, study, service, and recreation limit only by students' time, energy, and imagination.

In this atmosphere, George Washington University seeks to provide matrix for learning not available in the standard university educatio so that graduates can never forget that as students they were at th center of government and that they must forever carry addition responsibility in and for society, because of the opportunity that w theirs.

The George Washington Universit
LLOYD H. ELLIOTT
President

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HE CALENDAR 1985–1986*

1985 1986

AUGUST

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1985 FALL SEMESTER

August 26	Orientation and placement tests begin for new students and students from foreign countries
†*August 28–30*	Registration; application for February graduation due as part of registration
September 2	Fall Convocation; Labor Day (holiday)
September 3	On-campus and off-campus classes begin
September 4	University Faculty Assembly meeting
September 20	Faculty Senate meeting
October 2	Applications due for November Master's Comprehensive Examinations in the School of Public and International Affairs and in the School of Government and Business Administration
October 11	Faculty Senate meeting
October 17	Board of Trustees meeting
November 1	Applications due for spring semester financial aid

*The Academic Calendar is subject to change.
†The registration procedure and the hours of registration will be stated in the *Schedule of Classes*, which is available well in advance of each semester.

November 8	Applications due for Ed.D., Ed.S., and M.A. in Ed.&H.D. Comp hensive Examinations
	Faculty Senate meeting
November 8–9	School of Public and International Affairs and School of Gove ment and Business Administration Master's Comprehensive Examinations
November 18	D.B.A., D.P.A., Ed.D., and Ph.D. dissertations due from Febru candidates
November 27	Thanksgiving holiday begins after last class
December 2	Classes resume
December 3	Last day of fall semester on-campus classes
December 7	Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinati
December 9–18	Examination period
December 13	Faculty Senate meeting
December 16	Last day of fall semester off-campus classes

1986 SPRING SEMESTER

January 3	Master's theses due from February candidates
January 6–8	Orientation for new students and students from foreign countri advising for all students
January 8	All degree requirements to be completed and reported to t Graduate School of Arts and Sciences for February graduation
**January 8–10*	Registration; application for May graduation due as part of reg tration
January 13	Spring semester on-campus and off-campus classes begin
January 16	Board of Trustees meeting
January 17	Faculty Senate meeting
January 20	Martin Luther King Day (holiday)
January 21	University Faculty Assembly meeting
February 14	Faculty Senate meeting
February 16	Winter Convocation
February 17	George Washington's birthday observed (holiday)
February 26	Applications due for April Master's Comprehensive Examinati in the School of Public and International Affairs and the School Government and Business Administration
March 1	Deadline for submission of 1986–87 undergraduate financial a applications
	Ph.D. and Ed.D. dissertations due from May candidates
March 8	Spring recess begins after last class
March 14	Applications due for Ed.D., Ed.S., and M.A. in Ed.&H.D. Compr hensive Examinations
	Faculty Senate meeting
March 17	Classes resume
March 20	Board of Trustees meeting
March 24	D.B.A. and D.P.A. dissertations due from May candidates
April 1	Deadline for submission of summer sessions and 1986–87 grad ate financial aid applications

* The registration procedure and the hours of registration will be stated in the *Schedule Classes*, which is available well in advance of each semester.

April 11	Faculty Senate meeting
April 11–12	School of Government and Business Administration and School of Public and International Affairs Master's Comprehensive Examinations
April 12	Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinations
April 14	Master's theses due from all May candidates except those in the School of Public and International Affairs
April 17	All degree requirements to be completed and reported to the Graduate School of Arts and Sciences for May graduation
April 18	Last day of spring semester on-campus classes Master's theses due from May candidates in the School of Public and International Affairs
April 28	Last day of spring semester off-campus classes
April 24–May 3	Examination period
May 1	Last day for current master's degree candidates in the Graduate School of Arts and Sciences to apply for Ph.D. programs
May 2	Faculty Senate meeting
May 4	Commencement
May 15	Board of Trustees meeting

FACTS ABOUT GEORGE WASHINGTON UNIVERSITY

General Information	Private, nonsectarian, coeducational, founded 1821
Location	Washington, D.C., bounded by Pennsylvania Avenue and 19th, F, and 24th Streets, N.W.
Number of On-campus Students	9,210 full-time; 8,049 part-time
Geographical Origin of Students	50 states, District of Columbia, 120 countries
1985–86 Tuition	$275 per semester hour, to a maximum of $7,350 per academic year (see pages 27–32)
Number of Full-time Faculty	1,099 (89% with doctoral degrees)
Number of Part-time Faculty	575 (includes some of the most distinguished men and women in Washington)
Room and Board	Cost varies from approximately $4,170 to $4,760 for the academic year (see page 58)

Undergraduate majors: Accountancy, American Civilization, American Literatur Anthropology, Applied Mathematics, Art History, Biology, Botany, Business Administra tion, Cartography, Chemistry, Chinese Language and Literature, Civil Engineerin Classical Archaeology and Anthropology, Classical Archaeology and Classics, Classic Humanities, Computer and Information Systems, Computer Science, Criminal Justic Dance as a Performing Art, Dance Education, Dance Therapy, Early Modern Europe Studies, East Asian Studies (China or Japan), Economics, Electrical Engineering, Eleme tary Education, Elementary/Secondary Physical Education, English Literature, Enviro mental Studies, Exercise and Sport, Fine Arts, French Language and Literature, Geogr phy, Geology, Germanic Languages and Literatures, History, Human Services, Intern tional Affairs, Journalism, Judaic Studies, Latin American Studies, Liberal Art Literature in English, Mathematics, Mechanical Engineering, Medical Record Admini tration, Medical Technology, Middle Eastern Studies, Music, Nurse Practitioner, Nursi Anesthesia, Operations Research and Computational Science, Philosophy, Physicia Assistant, Physics, Political Communications, Political Science, Psychology, Publi Affairs, Radio–Television, Radiologic Sciences and Administration, Religion, Russia Language and Literature, Russian Literature and Culture—in Translation, Secondar Education, Sociology, Spanish-American Literature, Spanish Language and Literatur Special Education, Speech Communication, Speech–Language Pathology and Audiology Statistics, Theatre, Travel and Tourism, Urban Affairs, Zoology

Study leading to graduate or professional degrees is offered in the Graduate School Arts and Sciences, the National Law Center, the School of Medicine and Health Science the School of Engineering and Applied Science, the School of Education and Huma Development, the School of Government and Business Administration, and the School Public and International Affairs.

E UNIVERSITY

TORY

George Washington University had its beginning in 1821 as The Columbi-
College in the District of Columbia. The name of the institution was changed
.873 to Columbian University and in 1904 to The George Washington
versity. The debt of the University to George Washington, whose name it
's, is an intangible one.

eorge Washington, as President and as private citizen, had urgently insisted
n the establishment of a national university in the federal city. There he
ed that, while being instructed in the arts and sciences, students from all
s of the country would acquire the habits of good citizenship, throwing off
l prejudices and gaining at first hand a knowledge of the practice, as well as
theory, of republican government. To further the materialization of his
es, Washington left a bequest of fifty shares of The Potomac Company,
wards the endowment of a University to be established within the limits of
District of Columbia, under the auspices of the General Government, if that
ernment should incline to extend a fostering hand towards it." The
gress never extended a "fostering hand." The Potomac Company passed
of existence, and Washington's bequest became worthless.

ully conscious of Washington's hopes, but motivated primarily by a great
sionary urge and the need for a learned clergy, a group of dedicated
isters and laymen sponsored a movement for the establishment of a college
he District of Columbia. Inspired largely by the zeal and energy of the
erend Luther Rice, they raised funds for the purchase of a site and
tioned Congress for a charter. After much delay and amendment, Congress
nted a charter, which was approved by President Monroe on February 9,
1. To safeguard the College's nonsectarian character it provided "That
sons of every religious denomination shall be capable of being elected
stees; nor shall any person, either as President, Professor, Tutor or pupil, be
sed admittance into said College, or denied any of the privileges, immuni-
, or advantages thereof, for or on account of his sentiments in matters of
gion."

uring the entire time when the institution was known as Columbian
lege, its activities were centered on College Hill, a tract of forty-six and a
acres between the present Fourteenth and Fifteenth Streets extending
th from Florida Avenue to somewhat beyond Columbia Road. The Medical
ool was located downtown. For the better part of the Columbian University
iod, the buildings of the University were situated along H Street between
rteenth and Fifteenth Streets.

uring the last half-century, the University's present plant has been devel-
d in that section of the old First Ward familiarly known as "Foggy Bottom,"
ween Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue.
e area has many reminders of historic interest to the University. President
nroe, who signed the Charter, lived at 2017 Eye Street. The first President of
Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the
tor of a church at Nineteenth and Eye Streets, and Washington selected
enty-third and E Streets as the site of the National University he hoped to
established.

PURPOSE AND OBJECTIVES

The purpose of The George Washington University was to realize "t aspirations of Washington, Jefferson and Madison, for the erection of university at the seat of the Federal Government." Over the years it has been t aim to develop the University ideal in the nation's capital with a view towa meeting the changing needs of society while continuing to pursue the traditio al principles of learning and research.

The George Washington University now rededicates itself and all t resources at its command to the pursuit of knowledge and its disseminatio

To this end:

The University recognizes its special opportunities in and obligations to o of the principal capitals of the world. It is a primary objective of the Universi to utilize its historical, geographical, and functional relationship to the natio capital and the Washington community in continuing the development o great nationally and internationally oriented university.

The University recognizes the needs of our times and accepts the challenge develop each student's potential abilities to the fullest extent.

The University is and should remain privately controlled, nonsectarian, a coeducational.

Admission to the University is determined only in terms of the perso character and academic qualifications of the candidates.

A broadly based liberal education is fundamental to the total program of t University.

Expansion of graduate and professional studies and research and the utili tion for this purpose of the excellent research facilities and materials availa in the nation's capital are basic to the continuous development of University's educational program.

The provision of superior instruction and facilities and the application high standards of entrance qualifications and academic achievement to students whether full-time or part-time, on-campus or off-campus, are ma missions of the University.

A balanced program of student extracurricular activities is an integral part the University program.

The University will continue to strive to meet the evident needs of enlarged student body while governing the size of enrollment by its capacity supply adequate staff and facilities for the excellent teaching and research t it espouses.

THE COLLEGES, SCHOOLS, AND DIVISIONS

George Washington University includes nine colleges, schools, and divisio as follows:

*Columbian College of Arts and Sciences** offers four-year programs in arts and sciences leading to the degrees of Bachelor of Arts, Bachelor Science, and Bachelor of Music. The College also provides prelegal premedical programs and the preprofessional work required for admission the School of Public and International Affairs. Columbian College has acade jurisdiction over the off-campus programs leading to the degrees of Associat

* Columbian College of Arts and Sciences cooperates with the School of Medicine and He Sciences in offering a program leading to the combined degrees of Bachelor of Arts and Do of Medicine.

Arts in General Studies, Associate in Science in Cartography, Bachelor of General Studies, and Bachelor of Science in Cartography. These off-campus programs are administered by the Division of Continuing Education and Summer Sessions.

*The Graduate School of Arts and Sciences**† offers advanced study and research leading to the degrees of Master of Arts, Master of Fine Arts, Master of Forensic Sciences, Master of Music, Master of Science, Master of Science in Forensic Science, Master of Science for Teachers, and Doctor of Philosophy. The degrees of Master of Arts and Master of Science are also available through off-campus programs administered by the Division of Continuing Education and Summer Sessions.

*The School of Medicine and Health Sciences**‡ offers work leading to the degrees of Associate in Science, Bachelor of Science, Bachelor of Science in Health Science, and Doctor of Medicine.

The National Law Center† offers courses leading to the degrees of Juris Doctor, Master of Laws, Master of Comparative Law, Master of Comparative Law (American Practice), and Doctor of Juridical Science and special programs in Continuing Legal Education.

The School of Engineering and Applied Science offers courses leading to the degree of Bachelor of Science in the following areas: civil engineering, computer science, electrical engineering, mechanical engineering, and systems analysis and engineering. Graduate programs lead to the degrees of Master of Science, Master of Engineering Administration, Engineer, Applied Scientist, and Doctor of Science. The School has academic jurisdiction over the off-campus programs leading to the degrees of Master of Science, Master of Engineering Administration, and Doctor of Science. These off-campus programs are administered by the Division of Continuing Education and Summer Sessions.

The School of Education and Human Development offers undergraduate programs leading to the degrees of Bachelor of Arts in Education and Human Development and Bachelor of Science in Human Kinetics and Leisure Studies and graduate studies leading to the degrees of Master of Arts in Education and Human Development, Master of Arts in Teaching, Education Specialist, and Doctor of Education. The degree of Master of Arts in Education and Human Development is also available through off-campus programs administered by the Division of Continuing Education and Summer Sessions.

The School of Government and Business Administration† offers undergraduate programs leading to the degrees of Bachelor of Accountancy and Bachelor of Business Administration and graduate programs leading to the degrees of Master of Accountancy, Master of Association Management, Master of Business Administration, Master of Health Services Administration, Master of Public Administration, Master of Science in Information Systems Technology, Master of Taxation, Master of Urban and Regional Planning, Post-Master's Graduate

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* The Graduate School of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Master of Science and Doctor of Medicine and a dual program leading to the degrees of Doctor of Medicine and Doctor of Philosophy.

† The National Law Center cooperates with the School of Public and International Affairs, the Graduate School of Arts and Sciences, and the School of Government and Business Administration in offering programs leading to combined Juris Doctor and Master's degrees.

‡ Columbian College of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Bachelor of Arts and Doctor of Medicine.

Certificate in Health Services Administration, Doctor of Business Administra tion, and Doctor of Public Administration.

*The School of Public and International Affairs** offers undergraduate pro grams leading to the degree of Bachelor of Arts and graduate programs leadin to the degree of Master of Arts.

The Division of Continuing Education and Summer Sessions assists providing continuing education programs for adult students by administerin or coordinating the off-campus credit offerings of the colleges and schools the University, at both the undergraduate and graduate levels. Noncred courses are also offered through the Division.

ACADEMIC STATUS

George Washington University is accredited by its regional accrediting agenc the Middle States Association of Colleges and Secondary Schools.

The University is on the approved list of the American Association University Women and is a member of the College Entrance Examinatio Board.

The National Law Center is a charter member of the Association of America Law Schools and is approved by the Section of Legal Education and Admi sions to the Bar of the American Bar Association. The School of Medicine an Health Sciences is a member of the Association of American Medical Colleg and is one of the medical colleges that have been continuously approved by t American Medical Association. All undergraduate curricula of the School Engineering and Applied Science are accredited by the Engineering Accredit tion Commission of the Accreditation Board for Engineering and Technolog The School of Education and Human Development is a charter member of t American Association of Colleges for Teacher Education and is accredited the National Council for Accreditation of Teacher Education for its bachelor master's, and doctoral degree programs. The School of Government a Business Administration has maintained full membership in the Midd Atlantic Association of Colleges of Business Administration since 1961. joined the Council on Graduate Education for Public Administration in 196 In 1968, the School became a member of the American Assembly of Collegi Schools of Business; the Assembly accredited its undergraduate program 1977 and its master's program in 1982. The programs in accounting satisfy t educational requirements for the Certified Public Accountant and the Certifi Management Accountant professional examinations. The program in hea services administration is accredited by the Accrediting Commission Education for Health Services Administration. The Master of Public Admin tration program is on the approved list of the National Association of Schools Public Affairs and Administration. The Master of Urban and Regional Planni degree program is recognized by the American Planning Association. T Department of Chemistry is on the approved list of the American Chemic Society. The Department of Music is an accredited member of the Natio Association of Schools of Music. The graduate program in clinical psycholo in the Department of Psychology is on the approved list of the Americ Psychological Association. The graduate program in speech–language path ogy and audiology is accredited by the Education and Training Board of Boards of Examiners in Speech–Language Pathology and Audiology.

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* The National Law Center cooperates with the School of Public and International Affairs, Graduate School of Arts and Sciences, and the School of Government and Business Admin tration in offering programs leading to combined Juris Doctor and Master's degrees.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the University, including admission to education programs and employment. The University is subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Dr. Marianne R. Phelps, Associate Provost, George Washington University, Rice Hall, Washington, D.C. 20052, or to the Assistant Secretary for Civil Rights of the Department of Education.

LOCATION

The University is in downtown Washington, between Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. In immediately adjacent areas are the White House, the World Bank, the Corcoran Gallery of Art, the Department of State, the National Academy of Sciences, the John F. Kennedy Center for the Performing Arts, and many other governmental and cultural institutions.

THE UNIVERSITY LIBRARIES

The library collections of the University are housed in the Melvin Gelman Library (the general library of the University) and in the libraries of the National Law Center and the School of Medicine and Health Sciences.

These collections contain approximately 1,390,000 volumes, to which are added some 60,000 volumes a year. Endowments supplementing the University appropriation provide research materials in the fields of American civilization, American literature, art history, foreign service, history, labor relations, public finance, the social sciences, and transportation. Gifts from many sources have enriched the collections, including a large National Endowment for the Humanities grant to strengthen the University's humanities holdings. The libraries currently receive about 14,000 serials.

Information concerning the use of the libraries may be obtained at library service desks. Individual and class instruction in the use of the library and orientation to library facilities are given by librarians upon request.

The library strives to fulfill the curricular, research, and recreational needs and interests of the students. Through computerized searches of bibliographic data bases, the reference staff identifies and locates desired research materials not easily found through more traditional methods. The staff assists all members of the University in using the rich resources of the Washington area and the unusual opportunities they offer for extensive research.

Graduate degree candidates at George Washington University may, upon application, be issued a Consortium library card that permits direct borrowing from the main campus libraries of most other academic institutions in the Washington area. Graduate students may also obtain books and journal articles on interlibrary loan from other libraries in the city, throughout the United States, and in various other countries.

THE BOARD OF TRUSTEES OF THE UNIVERSITY

The University is privately endowed and is governed by a Board of Trustees which the President of the University is an *ex officio* member.

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Ex officio member
Chairman of the Executive Committee

ADMISSIONS

The University is coeducational and accepts applications for admission at t beginning of each semester and summer session.

An application for admission to degree candidacy should be accompanied a $20 (for undergraduate study) or $25 (for graduate study) application fe The application fee is waived for graduates of this University applying to t Graduate School of Arts and Sciences and for students applying for readm sion who were registered as degree candidates at the time of their l registration at this University and who have not since registered at anot institution.

Applicants are urged to submit the application form and complete cred tials well in advance of the semester or summer session for which they s admission. Specific dates are given in each section below.

Acceptance is based on available space and evidence of potential successful study. The following criteria are considered: degree or ma objective related to rigor of program and grades achieved in secondary sch or previous college, standardized test scores, relationship between grades a test scores, and recommendations.

The University reserves the right to refuse admission to any student with academic record that indicates doubtful ability to succeed in college. In evaluation process, there is no discrimination because of sex, race, religi handicap, national origin, or age.

UNDERGRADUATE ADMISSION†

Application forms for admission or readmission to undergraduate or nondeg status are available from and should be returned to the Office of Admissio George Washington University, Washington, D.C. 20052.

Secondary School Students

Applicants who wish to begin college in a summer session or in the semester should apply during the fall term of the senior year in high sch Preference will be given to students who submit applications and requi credentials prior to March 1. Students graduating at mid-year who wish begin college in the spring semester should apply no later than November

Applicants from secondary schools must arrange to have sent directly fr their schools to the Office of Admissions a complete academic record toge with a personal evaluation and recommendation from the principal. T information should be supplied on a standard form used by the second school.

Early Notification—Although decisions on most applications for the semester will require submission of seventh-term grades and senior-year scores, an earlier decision will be given after October 1 to students wh applications become complete with secondary school records through junior year and junior-year test scores, provided these records clearly estab admissibility.

Early Admission Plan—Exceptionally well-prepared students who h completed the junior year in high school may apply for early admission. T plan is designed for students with the emotional maturity, as well as

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* Application fee must be by check or postal money order, payable to George Washington University.
† For detailed admissions requirements, see the appropriate college or school in this *Bulletin*. See pages 25-2 admission requirements for students from foreign institutions.

ademic ability and background, necessary for college entrance. In most cases, pplicants accepted for early admission have exhausted academic offerings in condary school to the extent that remaining for the senior year is in the best terests of neither the students nor their schools.

To be considered for early admission, students must

1. demonstrate superior academic performance through the junior year of gh school;
2. meet the entrance requirements of the college or division applied to, by mpleting all required entrance units with the possible exception of the fourth ar of English;
3. have the unqualified recommendation of the secondary school principal or unselor;
4. submit two letters of recommendation (in addition to the counselor's) from achers who can testify to the student's maturity and general readiness to enter llege;
5. submit a letter from a parent or guardian supporting early college entrance;
6. arrange to have SAT or ACT scores sent directly to the University Office of dmissions by the testing agency;
7. take the College Board English Composition Achievement Test, a mathe- atics or science Achievement Test, and one other Achievement Test (of the udent's choice) and arrange to have the scores sent directly to the Office of dmissions by the testing agency.

ransfer Students

ndergraduate students from other institutions should submit applications d required credentials prior to June 1 for the fall semester, November 1 for e spring semester, and April 1 for the summer sessions.

To be accepted for transfer, a student must be in good standing as to holarship and conduct at all postsecondary institutions previously attended. student who has been academically dismissed will not normally be consid- ed for admission.

An applicant who has attended one or more institutions of higher education ust request each registrar to mail directly to the Office of Admissions a anscript of his or her record, *even if credits were not earned.*

If an applicant has fewer than 30 semester hours of acceptable work (C or tter in transferable academic courses from an accredited institution) at the me the application is submitted, his or her high school record and College ard or ACT test scores must be sent to the Office of Admissions directly from e high school and testing agency.

dvanced Tuition Deposit

ter notification of acceptance, a $100 advanced tuition deposit will be quired of all full-time undergraduate students, including those readmitted. his deposit is not due until May 1 for students entering in the fall semester or ntil December 15 for students entering in the spring semester. The deposit is edited toward tuition and is not refundable.

dvanced Standing and Advanced Placement

REDIT FROM INSTITUTIONS OF HIGHER LEARNING

here there is no duplication involved, either through course work or amination, credit may be granted for work successfully completed at other stitutions of higher learning. Assignment of transfer credit will depend on the

appropriateness of the courses completed elsewhere, the standing of t institution at which the previous work was completed, and the regulations the division of this University in which the credit is to be applied toward degree. Transfer credit must satisfy the requirements for the degree sought stated in this *Bulletin*. Credit may be accepted provisionally or may requ validation by examination or completion of higher-level courses in the sa sequence. Transfer credit will not be assigned for courses completed with low-pass grade (*D* or the equivalent); *advanced* professional (engineeri education, business) courses unless such courses are required for the studen GWU degree (credit for professional courses is limited to 12 semester hours Columbian College); course work completed in vocational/technical progra (e.g., secretarial studies); sub-freshman-level remedial work.

In the School of Government and Business Administration, there i limitation of three semester hours per course to be assigned for work comple at another institution; students transferring to that school from two-y colleges will receive no more than 60 semester hours of credit to be applied degree programs at this University. Columbian College of Arts and Scien and the School of Public and International Affairs accept a maximum of semester hours of credit from two-year colleges. In other undergradu divisions, there are no strict limits to the amount of transfer credit to assigned, but all students must satisfy the residence and course requireme for degrees sought at this University.

CREDIT BY EXAMINATION, FROM SERVICE SCHOOLS, FROM NONCOLLEGIATE ORGANIZATIONS, AND BY NONTRADITIONAL METHODS

Assuming there is no duplication of course work, a maximum of 30 semes hours of credit may be assigned upon admission to the University for one any combination of the following except as noted:

College Board Advanced Placement Tests (APT)—Credit is assigned examinations passed with scores of four or five on the basis of a score rep sent to the Office of Admissions from the Educational Testing Service at student's request. Examinations passed with scores of three may be consider for credit or placement if the student arranges to have the examination book sent to the Office of Admissions. The Advanced Placement Tests are admin tered in the secondary schools in May of each year. Normally only stude who complete a course designated as Advanced Placement are prepared for examination. Arrangements for the examination are the responsibility of applicant and should be made through the secondary school attended or w the Program Director, College Board, Advanced Placement Tests, Box 592- Princeton, N.J. 08541, or Box 1025, Berkeley, Calif. 94701.

College Board College-Level Examination Program (CLEP)—CLEP offers t types of examinations: General and Subject Examinations. CLEP Gene Examinations are offered in five areas: mathematics, social sciences, huma ities, natural sciences, and English composition. CLEP Subject Examinatio measure achievement in specific college-level courses and are offered in m than 40 subjects.

Credit is assigned for the General Examinations, with the exception of t English composition examination, passed at approximately the 50th percent or above (1963/1972 college sophomore norms).

Credit is assigned, with some exceptions, for the Subject Examinatio passed at the level recommended in the College Board model policy.*

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* See page 133 for additional qualifications for applicants to the School of Government and Business Administra

tudent registered in a degree program at this University must seek departmen-al and dean's approval *prior* to taking a CLEP Subject Examination for credit to e applied toward the degree. Credit may not be earned by passing the xamination after having taken an equivalent course. Arrangements for the xaminations are the responsibility of the student and should be made with the College Board College-Level Examination Program, Box 1822, Princeton, N.J. 8541.

Special Departmental Examinations for Undergraduates—Credit may be ssigned for Special Departmental Examinations administered by Columbian College departments to students enrolled in all undergraduate divisions of the niversity; see page 73.

Credit Earned Through USAFI and DANTES—Except to students enrolled in he School of Government and Business Administration, credit is assigned for pproved United States Armed Forces Institute (USAFI) and Defense Activity or Nontraditional Education Support (DANTES) courses.

Credit from Service Schools—Except to undergraduates admitted to the chool of Government and Business Administration, a limited amount of credit nay be assigned for selected service school courses completed after 1941. tudents seeking such credit should consult the Office of Admissions.

Credit for Courses Offered by Noncollegiate Organizations—Except to under-raduates admitted to the School of Government and Business Administration, limited amount of credit may be assigned for selected courses offered by oncollegiate organizations. The University accepts some of the recommenda-ions published in the *National Guide to Credit Recommended for Noncolle-giate Courses*. Students who wish to know whether courses offered by their mployers can be considered for credit should inquire at the Office of dmissions. Courses containing fewer than 30 hours of class instruction are ot reviewed. Records, which vary with the sponsoring organization, will be equired.

Credit for Courses Offered Through Correspondence and Television—Except o undergraduates admitted to the School of Government and Business Admin-stration, a limited amount of credit may be assigned for selected courses taught y nontraditional methods, provided that such courses require the student's hysical presence during a monitored final examination. Assignment of such redit will require a statement from the sponsoring agency that such an xamination was a required part of the course.

DVANCED PLACEMENT OR WAIVER BY EXAMINATION

Advanced placement or waiver of a requirement will be granted on the basis of scores on Achievement Tests of the College Board as follows:

Achievement Test	Minimum Score	Exemption
English Composition	650	Waives Engl 10
European and/or American History	600	Waives Hist 39–40 and/or 71–72
French	650	Waives a two-year language requirement
German	600	
Hebrew	600	
Latin	600	
Russian	700	
Spanish	650	

A score of 58 or above on the SAT Test of Standard Written English, or a sco of 28 or above on the ACT English Usage Test, will waive English 10.

GRADUATE ADMISSION*

Graduate School of Arts and Sciences—Application forms for admission readmission are available at the Office of the Dean of the Graduate School Arts and Sciences, George Washington University, Washington, D.C. 200 Completed applications and requests for fellowship support must be submitt by February 15 (February 1 for students in clinical psychology and art thera for admission in the fall semester and by November 1 for the spring semest Applications for graduate study are acceptable after these dates for review a possible admission in the corresponding semester only if time permits and space is available in the program desired.

School of Education and Human Development—Application forms admission or readmission are available at the Office of the Dean of the School Education and Human Development, George Washington University, Washi ton, D.C. 20052. Completed application forms should be submitted to t office no later than June 1 for the fall semester, November 1 for the spri semester, and April 1 for the summer sessions, unless an extension is grant by the office of the dean.

School of Government and Business Administration—Application forms admission or readmission are available at the Graduate Admission Offi School of Government and Business Administration, George Washing University, Washington, D.C. 20052. The Application for Graduate Deg Candidacy shows the deadlines for applications to the graduate progra offered by this school.

School of Public and International Affairs—Application forms for admiss or readmission are available at the Graduate Admissions Office, School Public and International Affairs, George Washington University, Washingt D.C. 20052. Completed application forms should be submitted to that office later than March 1 (February 1 for foreign applicants and applicants graduate fellowship or assistantships). Admission is for the fall semester on All credentials, including transcripts from all institutions attended, Gradu Record Examination scores, and letters of reference, must be received bef the deadline date.

DIVISION OF CONTINUING EDUCATION AND SUMMER SESSIONS

The Office of University Students in the Division of Continuing Education Summer Sessions makes on-campus credit courses available to *nondeg students*. Application forms for admission to nondegree status in this Divis are available from and should be returned to the Office of Admissions, Geo Washington University, Washington, D.C. 20052. Completed application for and any credentials required should be received by the Office of Admissions later than the Friday before the first day of registration (see Calendar, page To avoid paying a late registration fee, applicants should make sure that necessary forms and credentials are in the Office of Admissions prior registration. There is no fee for applying to this Division. For detailed entra requirements, see page 185.

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* For detailed admission requirements, see the appropriate college or school in this *Bulletin*. See pages 25–26 admission requirements for students from foreign institutions.

udents in this Division may not take accountancy, business administration, anagement science courses; registration in other courses may be denied ents in nondegree status when space is needed for degree students.

DMISSION

iously registered students who wish to resume studies on campus after ntinuing enrollment for one or more semesters (summer sessions exclud- must apply for readmission. Deadlines for readmission applications from ents in good academic standing are the same as those for new applications pages 20–21 and 24–25). Students who discontinued enrollment while on emic probation or under suspension should allow at least one month for opriate processing of readmission credentials. Students seeking readmis- after having attended other institutions of higher education in the interim have complete official transcripts sent to the appropriate office at this ersity from all other institutions attended. Students seeking readmission egree candidates after previous enrollment in nondegree status must nit all entrance credentials not previously received or required.

pplicants for readmission are subject to the University regulations in effect e time of readmission.

e application fee is waived for students applying for readmission after ious enrollment as degree candidates at this University if they have not e registered at another institution.

DENTS FROM FOREIGN INSTITUTIONS*

lications, required records, and scores on the Test of English as a Foreign guage (see below) should be received from international students no later March 1 (February 1 for some graduate programs) for the fall semester and ber 1 for the spring semester.

ired Records

he time the application is sent, students must have the educational tutions previously attended send directly to the appropriate admissions e (see Undergraduate Admission, pages 20–21, or Graduate Admission, s 24–25) copies of official certificates and records listing subjects studied, es received, examinations taken, and degrees received. Certified copies of omas and certificates from all secondary schools, colleges, and universities ded are required. Records of state examinations and certificates are also ired. These records become the property of the University and cannot be rned.

ese documents should be in the language in which the institution keeps its al records. If they are in a language other than English, the copies sent ld be accompanied by an English translation.

guage Tests

ents whose native language is not English are urged to take the Test of lish as a Foreign Language (TOEFL). Those applying to the School of ernment and Business Administration or to the cartography programs are ired to submit a TOEFL score. Students are responsible for making

*detailed admission requirements see the appropriate college or school in this *Bulletin*

arrangements to take the test by addressing inquiries to TOEFL, Box
Princeton, N.J. 08541. The completed registration form must be returned
in advance of the semester for which admission is sought. On the applic
for the TOEFL, students should specify that the scores are to be sent t
appropriate admissions office at this University (see Undergraduate A
sion, pages 20–21, or Graduate Admission, pages 24–25). Registration fo
TOEFL does not constitute application for admission to George Washi
University.

An admitted student scoring below 600 on the TOEFL is required to ta
English Placement Test for Foreign Students prior to registering at the Uni
ty. Depending on the results of this test, the student's academic program m
restricted in number and type of courses that can be taken. College credit
granted for remedial English study.

Financial Certificate

A Financial Certificate must be completed and submitted with the applic
for admission of all international students planning to study at the Univ
under the authorization of either a student (F) or exchange visitor (J)
Satisfactory completion and submission of the Financial Certificate is req
for the issuance of a Form I-20 or IAP-66.

TRANSFER WITHIN THE UNIVERSITY

For information concerning transfer from one college, school, or divisi
another within the University, see page 47.

REGISTRATION

The dates, hours, and place of registration will be stated in the *Schedu*
Classes, which is available well in advance of each semester.

Registration in on-campus courses is open only to those persons for
admitted to the University by the appropriate admitting office, as well as
students in good standing who are continuing in an approved program of s

No registration is accepted for less than a semester or one summer ses

Students may not register concurrently in this University and an
institution without the prior permission of the dean of the college, scho
division in which registered in this University. Registration in more tha
college, school, or division of the University requires the written permissi
the deans concerned, *prior to registration*. Allowance of credit for work
concurrently at another institution is at the discretion of the appro
committee.

Eligibility for Registration

Registration for the following categories of campus students is held on the
of registration stated in the University Calendar. A student who is suspend
whose record is not clear for any reason is not eligible to register. Regist
in a given course may be denied students in the Division of University
Summer Students when space is needed for degree candidates.

New Student—Upon receipt of a letter of admission, the new stud
eligible for registration on the stated days of registration.

eadmitted Student—A student previously registered in the University who not registered on campus during the preceding semester or summer session st apply for and receive a letter of readmission from the appropriate nitting office before he or she is eligible for registration.

ontinuing Student—A student registered on campus in the immediately ceding semester or the summer session preceding the fall semester is ible to register assuming good standing and enrollment in a continuing gram.

npletion of Registration

istration is not complete until financial settlement is made. Attendance in s is not permitted until registration has been completed.

istration Changes and Withdrawals (see page 47)

istration for Consortium Courses

ree students interested in taking courses at any of the other institutions in Consortium of Universities of the Washington Metropolitan Area, Inc. (see e 51), should consult the program announcements of the other institutions. sortium registration forms and instructions may be picked up in the Office ne Registrar after obtaining registration materials. In order to participate in Consortium program, students must obtain the approval of an advisor and uld ascertain from the department of the institution where the course is ght whether they are eligible for the course and whether there is space in the s. Specific inquiries should be addressed to the Registrar.

ES AND FINANCIAL REGULATIONS

s paid by students cover only a portion of the cost of the operation of the versity. Income from endowment funds, grants, and gifts from alumni and nds of the institution makes up the difference.

he following fees and financial regulations were adopted for the 1985 mer sessions and the academic year 1985–86.

tion Fees

undergraduate and graduate study in Columbian College of Arts and Sciences, the duate School of Arts and Sciences, the School of Education and Human Development, School of Government and Business Administration, the School of Public and rnational Affairs, and the Division of Continuing Education and Summer Sessions:

campus program, each semester hour, to a maximum of $3,675 per semester	$275.00
campus program, each semester hour	185.00
mer Sessions, each semester hour	223.00

yment of tuition for a master's thesis entitles the candidate, during the period of tration, to the advice and direction of the member of the faculty under whom the is is to be written. In case a thesis is unfinished, additional semester hours may be ired in accordance with the regulations of the school in which the student is tered.

udents entering doctoral programs in the School of Government and Business inistration in 1985–86 will be charged $18,680 for the entire degree program, to be in 10 semiannual installments.

University Center Fee (charged all students registered on campus)
Each semester hour, to a maximum of $82.50 per semester

Additional Course Fees—In certain courses additional fees, such as laboratory material fees, are charged by semester as indicated in the course descriptions. If breakage of apparatus is in excess of the normal amount provided for in the laboratory fee, the student will be required to pay such additional charges as are determined by the department concerned.

Computer Usage Fees (charged for courses that use the computer facilities of the University)—Applicable fees are listed in the *Schedule of Classes* for each semester. The maximum computer usage fee is $100 for any semester.

Residence Hall Fees (see page 58)

Special Fees and Deposits

Application fee (undergraduate degree candidate), nonrefundable
Application fee (graduate degree candidate), nonrefundable
Advanced tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student
Housing deposit, nonrefundable, charged each applicant for residence hall space
Admission tests (when required)
Late-registration fee, for failure to register within the designated period (charged on-campus students only):
- During first week of classes
- During second and third weeks of classes
- After third week of classes (if permitted)

Late-payment fee (see Payment of Fees, below)
On-campus financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, below)
Off-campus financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, below)
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason
Binding master's thesis
Microfilm service and printing announcement of final examination (doctoral candidates)
Special Columbian College of Arts and Sciences departmental examination to qualify for receiving credit (advanced standing), waiver of requirement, or both
Waiver examination to qualify for advanced placement
English test for international students (when required)
Laboratory check-out fee, for failure to check out of chemistry laboratory by the deadline date set by the instructor*
Charles E. Smith Center fee (for off-campus degree candidates only): Students registered as degree candidates in a program offered through the Division of Continuing Education and Summer Sessions may purchase, on a semester-by-semester basis, a special card entitling them to use the Smith Center facilities for that semester or session. Students must first obtain from the Division a signed certificate attesting to degree candidacy
Statement issued by the Department of Romance Languages and Literatures certifying the degree of oral and/or written fluency and command of the French, Italian, Portuguese, or Spanish languages

* A student who drops a chemistry course before the end of the semester must check out of the laboratory at the laboratory period

nscript fee	2.00
two or more transcripts are requested at the same time, fee for each of the rst two copies is $2, fee for each additional copy	.50
lacement of lost or stolen picture identification card	2.00

gistration for on-campus courses in the University entitles each student to following University privileges: (1) the services of the Career Services nter; (2) the use of the University Library; (3) gymnasium privileges; (4) nission to all athletic contests, unless otherwise specified; (5) subscription he *Hatchet*, the student newspaper; (6) admission to University debates; (7) dical attention as described under Student Health Service. These privileges minate when the student withdraws or is dismissed from the University.

tdoctoral Study

ose who have graduated from George Washington University with a Ph.D., D., D.Sc., D.B.A., or D.P.A. may continue any studies in the University hout payment of tuition (contingent upon the availability of space) and may oy all University library privileges. Such graduates are required to pay a minal fee based on the prevailing credit hour rate for one semester hour, as ll as the University Center fee, in order to establish their active membership the University. The use of laboratory space and equipment is contingent on availability, and the cost of all laboratory or special library material is d by the graduate. Special arrangements for such privileges must be made th the dean two months in advance of the semester in which the graduate shes to register. Postdoctoral work taken under this privilege may not be en for credit.

jected Tuition Fee Increases 1986–1989

that students and their parents may plan more realistically for a total four-ar period, increases in tuition rates for the academic years 1986–87, 1987–88, d 1988–89 have been estimated.

Excluding students enrolled in the School of Medicine and Health Sciences d the School of Engineering and Applied Science, the University estimates t tuition rates for currently enrolled students (including those enrolled in 85–86) will not be increased by more than 10% in each of the years 1986–87, 87–88, and 1988–89.

It is not possible to project future economic data with certainty. These creases are merely estimates based on present circumstances and should in way be interpreted as fixed limits on tuition increases. The University ends to keep tuition increases as low as possible, but it is obligated to aintain a sound financial basis. Economic conditions, particularly as they ect private educational institutions, have been extremely variable, and gnificant increases in tuition rates in excess of the above limits may be quired.

yment of Fees

student is permitted to complete registration or attend classes until all arges are paid or until arrangements for payment have been made. Tuition d fees for each semester are due and payable in full at the Office of the shier at the time of each registration. Checks should be made payable to orge Washington University, with the student identification number in the per left corner.

The Student Accounts Office has responsibility for billing and maintai student accounts for tuition, various fees, and room and board charge student registered for six semester hours or more may sign a deferred payn contract with the Student Accounts Office at the time of each registra permitting payment of one-half of the total tuition and fees (except for payable in advance) at the time of registration and the remaining half o before Wednesday of the eighth week of classes for the fall and sp semesters. Interest at the rate of 8 percent per annum on the unpaid bal will be charged from the date of registration to the date payment is made. A month payment plan is also available.

Students receiving tuition assistance in the form of scholarships, governn tuition contracts, or other forms of tuition awards are not permitted to deferred payment contracts unless the total tuition and fee charges exceed value of the tuition awards by $800 or more. Under such circumstances student may be permitted to pay one-half of the amount due at the tim registration and to defer the balance by signing a deferred payment contr

Students who fail to make any payment when due will be automatic charged a $15 late-payment fee and will be subject to the interest charge percent per annum. Accounts that become 30 days past due will be financ encumbered. In the event a student's account is financially encumbered, student forfeits rights to the use of deferred payment contracts in fu semesters, and the Student Accounts Office will notify the Registra withhold grades, future registration privileges, transcripts, diplomas, and o academic information until the account is settled financially. In addi applications for institutional and federal financial aid cannot be proce until all encumbrances, including those for unpaid emergency loans, have b paid. Financial settlement will require payment in full of all amounts du the University in addition to a financial reinstatement fee of $35 for on-cam students and $15 for off-campus students.

Students auditing courses are subject to all fees charged to students r tered for credit.

Returned Check Policy—A student whose check is returned unpaid by bank for any reason will be charged a returned check fee. If the check is paid within 15 days, the student's account will be financially encumb with the same restrictions and penalties as for late payment enumerated ab

One-Year Prepaid Tuition Plan—Undergraduate students paying the set u limit of tuition may receive a discount for the spring semester if payme made for the full academic year at the time of fall registration. At the 198 rate, students choosing this plan would pay $7,275 for two semesters inste $7,350.

Four-Year Prepaid Tuition Plan—New undergraduate students may ele pay in advance the total tuition for their full four-year program at the applicable to their first year. A payment under this plan for programs begin with the 1985 fall semester would total $29,400. Refunds to students wh not complete their full four-year programs would be made at the original for all remaining full semesters.

Commercial Prepaid and Deferred Payment Plans—Several commercial grams for parents who wish to pay for college on a monthly basis are a able. Terms and conditions vary, but most provide a life insurance poli the contract. For specific details and applications, address inquiries to following:

ard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
hard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
e Tuition Plan, Inc., Concord, N.H. 03301

-Campus Courses

es for each semester are due and payable in full at the time of each istration; however, a student registering for a 13-week or longer credit urse may sign a deferred payment contract at each registration to make yments in three equal installments—one-third at the time of registration, e-third by October 3, and one-third by November 3 (for the fall semester); e-third at the time of registration, one-third by February 7, and one-third by rch 6 (for the spring semester). Payments are due at the stipulated times. erest at the rate of 8 percent per annum on the unpaid balance will be rged from the beginning of each semester to the date payment is made.
Students receiving partial government tuition assistance, employee benefits, l partial scholarships must pay their portion of the tuition in full at the time registration.
Except for specified special sessions, tuition and fees for credit courses ing less than 13 weeks and for all noncredit courses are payable in full at istration.

thdrawals and Refunds*

plications for withdrawal from the University or for change in class edule must be made in person or in writing to the dean of the college, ool, or division in which the student is registered. Notification to an tructor is not an acceptable notice (see Withdrawal, page 47).
n authorized withdrawals and changes in schedule, cancellations of semes- tuition charges and fees will be made in accordance with the following edule for the fall and spring semesters:

Complete withdrawal from all courses (on-campus students):

Withdrawal dated on or before Friday of the first week of classes	90%
Withdrawal dated on or before Friday of the third week of classes	75%
Withdrawal dated on or before Friday of the fifth week of classes	50%
Withdrawal dated after the fifth week of classes	None

Partial withdrawal: If the change in program results in a lower tuition charge, the refund schedule above applies to the difference.
Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.
Summer Sessions: In cases of authorized withdrawals from courses, refunds of 75% of tuition and fees will be made for courses dropped within the first seven calendar days following the scheduled registration day. No refund will be made for courses dropped thereafter.
Refund Schedule for Off-Campus Registration:
Long Session (or any session longer than 13 weeks)

Starting date of class plus 6 calendar days	90%
Starting date of class plus 20 calendar days	75%
Starting date of class plus 34 calendar days	50%
Starting date of class plus 35 calendar days to end	None

refund of the $100 tuition deposit required of entering students is granted

Intermediate Session (9 weeks, 1 day per week)
- Starting date of class plus 6 calendar days
- Starting date of class plus 13 calendar days
- Starting date of class plus 20 calendar days
- Starting date of class plus 21 calendar days to end

Short Session (7 weeks, 2 days per week)
- Starting date of class plus 2 calendar days
- Starting date of class plus 8 calendar days
- Starting date of class plus 15 calendar days
- Starting date of class plus 16 calendar days to end

Mini Session (3 weeks)
- Starting date of class plus 1 calendar day
- Starting date of class plus 5 calendar days
- Starting date of class plus 9 calendar days
- Starting date of class plus 10 calendar days to end

No refund will be made for sessions of less than 21 days.

Refund policies of the University are in conformity with guidelin refunds as adopted by the American Council on Education.

In no case will tuition be reduced or refunded because of absence classes.

Authorization to withdraw and certification for work done will not be g student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can banking arrangements in the community.

FINANCIAL AID

George Washington University offers a program of financial assistanc undergraduate and graduate students. Undergraduate aid consists of two types: awards for academic achievement without reference to financial cir stances (honor scholarships) and scholarships, grants, loans, and employ based upon demonstrated financial need. The program of financial assis for graduate students includes assistantships, fellowships, traineeships, g ate scholarships, research appointments, part-time employment, and l Undergraduate scholarships and all federal aid require that the recipie registered for a full-time course load at GWU. Loans and resident assistant not based on financial need are available to undergraduates and grad alike. In general, consideration for financial aid is restricted to students in academic standing who meet the minimum grade point average for parti awards and are not financially encumbered by any other University o Information on the various programs follows.

SCHOLARSHIPS AND OTHER FORMS OF AID FOR UNDERGRADUAT

Honor Scholarships—George Washington University honor scholarshi up to half-tuition for the academic year, based entirely upon acad achievement and potential without regard to financial need, are restrict incoming freshmen.

Need-Based Aid—The University offers extensive programs of scholar grants, loans, and employment based upon demonstrated need. The Univ

rticipates in the National Direct Student Loan, Pell Grant (formerly Basic ucational Opportunity Grant), Supplemental Educational Opportunity ant, and the College Work-Study programs.

Applications and supporting credentials for financial aid must be filed by rch 1 (all undergraduate students) preceding the academic year of the award the fall semester; by November 1 for the spring semester; and by April 1 for summer sessions.* A student must reapply for all financial aid, including olarships, each year; renewal is contingent upon funds being available en the student completes the application.

Complete information concerning financial assistance is contained in the dent financial aid pamphlet, which is available at the Office of Student ancial Aid, George Washington University, Washington, D.C. 20052.

The following scholarships are available to students in Columbian College of ts and Sciences, the School of Education and Human Development, the hool of Government and Business Administration, and the School of Public d International Affairs.

The George Washington University Board of Trustees Scholarships—Full- l partial-tuition scholarships begin in the fall semester and may be renewed ough the senior year, provided the holder reapplies by the published adlines, maintains a *B* average, and continues to be in financial need. ndidates must plan to select a curriculum leading to a bachelor's degree in y school listed above.

her Scholarships

hievement Rewards for College Scientists (ARCS) Foundation, Inc., Scholar- ship
erman Page Allen Memorial Scholarship Fund (1966)
umni Scholarships
ary I. Anderson Scholarship (1969)
hletic Scholarship Fund (1979)
che and Company Scholarships
ron Andrews Scholarship (1920)
nry N. Brawner, Jr., Foundation Scholarship Fund (1963)
. A.D. Britt Scholarship Fund (1984)
nna K. Carr Scholarships (1932)
aria M. Carter Scholarship (1871)
ul E. Casassa Memorial Foundation Scholarship (1968)
e Chesapeake and Potomac Telephone Company Scholarship (1978)
lumbian Women Scholarship Funds
Victoria Briggs Scholarship Fund (1959)
Elizabeth V. Brown Scholarship Fund (1925)
Grace Ross Chamberlin Scholarship Fund 1932)
College Women's Scholarship Fund (1926)
Columbian Women Members' Scholarship Fund (1961)
Arline Hughes Dufour Scholarship Fund (1961)
Dr. Watson W. Eldridge, Jr., and John F. Eldridge Scholarship Fund (1964)
Founders of Columbian Women Scholorship Fund (1920)

Only students who are enrolled in this University for at least six semester hours in the mediately preceding spring semester or who have applied for financial aid for the following l semester are eligible for consideration for summer sessions financial aid, provided that y will graduate at the end of that summer or the following fall semester or are required by ir program to attend the summer sessions.

Ross Lees Hardy Foundation Scholarship Fund (1957)
Lillian Young Herron Scholarship Fund (1925)
Nellie Maynard Knapp Scholarship Fund (1915)
Marcia B. Kraft Scholarship Fund (1966)
Janet McWilliams Scholarship Fund (1954)
Marie-Louise Ralph Turner Scholarship Fund (1963)
Isaac Davis Scholarship (1869)
District of Columbia Daughters of the American Revolution Scholarship (1
District of Columbia Institute of Certified Public Accountants Scholarshi
Accounting (1964)
Estella Constance Drane Scholarship (1957)
Vincent J. DeAngelis Scholarship Fund (1983)
Robert Farnham Scholarship (1871)
Federal Government Accountants Association—Washington, D.C., Chapt
Scholarship in Accounting
Esther Brigham Fisher Scholarship (1951)
George Washington University Tennis Alumni Association Scholarship (1
Mildred Green Memorial Scholarship Fund (1959)
Gridiron Foundation of the Gridiron Club Scholarship (1975)
Isadore and Bertha Gudelsky Family Scholarship (1978)
Anna Spicker Hampel Scholarship (1949)
Elma Lewis Harvey Scholarship (1921)
Hazelton Scholarship (1950)
George F. Henigan Scholarships in Debate (1967)
Albert A. and Esther C. Jones Scholarship Fund (1981)
Allen M. Jones Scholarship Fund (1981)
David B. and James L. Karrick, Jr., Scholarship Fund (1968)
Samuel and Elizabeth Kay Scholarships (1969)
Amos Kendall Scholarship (1869)
L. Poe Leggette Memorial Scholarship Established by WRGW (1968)
Mary and Daniel Loughran Scholarship (1976)
Barry Manilow Endowed Music Scholarship (1984)
Martha's Marathon Residence Hall Scholarship (1969)
Maud E. McPherson Scholarship in English and American Literature (197
A. Morehouse Scholarship (1861)
E. K. Morris Education Fund Scholarships (1972)
Helen Marie and Thomas E. Orr Scholarships (1965)
Hardy Pearce Scholarship Fund (1972)
Phi Delta Gamma Scholarships (1956)
Fred B. and Alma D. Pletcher Scholarship Fund (1968)
Levin M. Powell Scholarships (1886)
Research Assistantships in Operations Research and Related Fields
Resident Assistantships
Henry Whitefield Samson Scholarship Fund (1966)
Lula M. Shepard Scholarships (1946)
Mildred Shott Scholarship Fund (1981)
Sigma Delta Chi Foundation of Washington, D.C., Scholarships
Myrna Sislen Guitar Scholarship (1983)
Margaret Lucille Snoddy Scholarship (1970)
David Spencer Scholarship (1918)
George Steiner Scholarship in Music (1985)
Mary Lowell Stone Scholarship (1893)
Charles Clinton Swisher Scholarships (1941)

S. Office of Education Traineeships (1964)
iversity Players Scholarship in Memory of L. Poe Leggette (1968)
lliam Walker Scholarship (1824)
igail Ann Brown and Henry Kirk White Scholarship Fund (1963)
n Withington Scholarship (1830)
)men's Physical Education Alumnae Association Scholarship (1964)
lliam G. Woodford Scholarship (1969)
en Woodhull Scholarship (1919)
nta Club Scholarship (1950)

ants

The GWU Grant Program—Established for students who still have financial ed after all other sources have been exhausted.
Other Grants—The following funds have been established to meet the special eds of disadvantaged students from the District of Columbia inner city and e Washington metropolitan area.

orge Washington University's Educational Opportunity Program Tuition Grants (1968)
y Club of Walt Whitman High School, Bethesda, Md., Grant (1968)
arriott Foundation Grant (1968)

SSISTANTSHIPS, FELLOWSHIPS, AND OTHER FORMS OF AID OR GRADUATE STUDENTS

pplication and correspondence concerning assistantships, fellowships, train-ships, or graduate scholarships should be sent directly to the dean of the hool concerned and addressed to George Washington University, Washing-n, D.C. 20052. Unless otherwise specified, application and supporting edentials should be submitted no later than February 1 preceding the ademic year for which the award is made. Application for admission to aduate study is a prerequisite for consideration.

ssistantships

Research Assistantships—Available in the fields of computer science, eco-omics, operations research, psychology, sociology, and statistics through the raduate School of Arts and Sciences and its participation in sponsored rograms with the Consortium of Universities of the Washington Metropolitan rea.
Graduate Teaching Assistantships—Available to graduate students in mas-r's and doctoral programs in most departments of the University. A graduate aching assistant receives financial compensation for a designated unit of rvice to the assistant's major department of instruction.
Other Assistantships—
ealth Services Administration Research Assistantships
ational League of Cities/George Washington University Assistantship
rban Affairs Assistantship

llowships, Internships, Traineeships, Special Programs

he following fellowships, internships, and traineeships are available to udents in the Graduate School of Arts and Sciences, the School of Education d Human Development, the School of Government and Business Administra-

tion, and the School of Public and International Affairs. The University a
offers many other fellowships that are available to students in these colle
and schools.

University Fellowships—Available to graduate students in master's a
doctoral programs in most departments of the University. Fellowships
based on scholarship and each fellow may receive a stipend, tuition allowan
and course fees.

Research Traineeships—Available under numerous sponsored programs i
number of departments. Currently, the basic medical science departments a
the Departments of Psychology and Speech and Hearing offer such progra
Stipends vary; information is available from the departments and the Office
the Dean of the Graduate School of Arts and Sciences.

Other Fellowships, Internships, Traineeships, and Special Programs—
Achievement Rewards for College Scientists (ARCS) Foundation, Inc., Fellowship
Robert A. Aleshire Fellowship Fund (1971)
American Association of Collegiate Schools of Business Fellowship
American Civilization Fellowships
American Civilization Internships (Smithsonian Institution–George Washi ton University Cooperative Program)
American Iron and Steel Institute Fellowship
Arthur Anderson & Co. Doctoral Fellowship
Aryamehr Research Fellowships
Winfield Scott Blaney Fellowship in International Affairs (1961)
Oliver T. Carr, Sr., Memorial Fellowship in Urban and Regional Planning (1973)
Thomas Alva Edison Fellowship
Elementary Teacher Education Internships
Ernst & Ernst Grant to Doctoral Candidates in Business or Economics
Health Services Administration Fellowships
Richard D. Irwin Doctoral Fellowships
Rita H. Keller Scottish Rite Scholarships and Fellowship Fund (1981)
Isabella Osborn King Research Fellowships (1927)
Loula D. Lasker Fellowships in Housing, City Planning, or Urban Renewal
George McCandlish Fellowship in American Literature (1980)
Mellon Foundation Fellowships
Minorities in Planning and Related Professions Program
National Association of Purchasing Management Fellowship
National Historical Publications Commission–George Washington Univers Cooperative Research Fellowships
National Science Foundation Graduate Fellowships
Resources for the Future, Inc., Fellowship Prize
Rose Bibliography Internships
Thomas Bradford Sanders Fellowships (1928)
Scottish Rite Foundation Fellowships
U.S. Office of Education Fellowships (1964)
U.S. Public Health Service Traineeships
U.S. Public Health Service Traineeships in Comprehensive Health Planni
Urban Studies Fellowships of the Department of Housing and Urban Development
Urban Transportation Center Fellowship
Ronald Barbour Weintraub Research Fellowship in Biological Sciences (19

aduate Scholarships

med Forces Health Professions Scholarship Program (The Uniformed Services Health Professions Revitalization Act of 1972—Public Law 92–426)
rbee Sculptor Scholarship (1975)
ma K. Carr Scholarships (1932)
strict of Columbia Institute of Certified Public Accountants Scholarship in Accounting (1964)
netics Graduate Scholarship (1979)
bert A. and Esther C. Jones Scholarship Fund (1981)
len M. Jones Scholarship Fund (1975)
ary and Daniel Loughran Graduate Scholarship (1976)
ster G. McGaw Scholarship in Health Care Administration (1971)
ul Pearson Scholarship Fund (1940)
i Delta Gamma Scholarship Fund (1968)
ildred Shott Scholarship Fund (1981)
oorhees Scholarships
olcott Foundation Scholarships

ponsored Awards for Graduate Study

nformation regarding awards sponsored by foundations, professional and earned societies, industries, and others which may be used in support of raduate study is available at the Graduate Fellowship Information Center, 130 H St., N.W., Room 621D, for students enrolled at George Washington University. Information is also available on distinguished programs such as the Rhodes, Marshall, National Science Foundation, Fulbright, Luce, and Rotary International, as well as many others.

As deadlines for application vary, qualified students should make inquiries well in advance of the year of planned graduate study.

FORMS OF AID AVAILABLE TO UNDERGRADUATE AND GRADUATE STUDENTS

Assistantships

Research Assistantships in Operations Research and Related Fields—Available to graduates, and to undergraduates on the junior and senior levels, in any school of the University. Research assistants are expected to work 20 hours a week, conducting research in support of an established research program, programming, or conducting individual research on an approved research project. Stipends range up to $10,000, depending on the status of the student and the tenure of the appointment (9–12 months). Further information and applications are available from Director, Institute for Management Science and Engineering, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052.

Resident Assistantships (men and women)—Available to graduate students and seniors in any field of study who are interested in working with the student personnel program in University residence halls. Specific duties vary with the position, but basically consist of counseling, advising student groups, and administration. Remuneration includes partial tuition and a furnished room for the academic year. All positions are part time, and staff members are required to enroll as full-time students in degree programs. Further information may be obtained from the Office of the Director of Housing and Residence Life.

Loan Funds

The following loan funds are available to undergraduate and/or gra students in Columbian College of Arts and Sciences, the Graduate Sch Arts and Sciences, the School of Education and Human Development School of Government and Business Administration, and the School of P and International Affairs. A separate application must be submitted for all programs. Applications for the National Direct Student Loan should be file later than March 1 (all undergraduates) or April 1 (graduate students) fo following academic year. Complete information is contained in the stu financial aid pamphlet, which is available from the Office of Student Fina Aid, George Washington University, Washington, D.C. 20052.

American Medical Association Nursing Home Administration Loan Fund
George F. Henigan Loan Fund (1975)
International Student Loan Fund (1967)
Joanne Jacobs Student Loan Fund (1974)
W. K. Kellogg Foundation Hospital Administration Loan Fund
Jessie B. Martin Loan Fund (1967)
National Direct Student Loan Program
Hiram Miller Stout Memorial Loan Fund (1973)
University Student Emergency Loan Fund
The GWU Supplemental Loan Fund (1983)
The Edmund W. Dreyfuss Loan Fund (1983)
The Peter and Doris Firsht Loan Fund (1983)

Guaranteed Student Loan Program—George Washington University is eligible participant in the Federally Insured State Guaranteed Student L Program. Undergraduate students may apply for a maximum of $2,500 per y Graduate students may apply for a maximum of $5,000 per year. Students intend to use the loan for payment of tuition at registration should submit application, as well as all required supporting documents, no later than Jun

Parents Loan for Undergraduate Students Graduate Students—George W ington University is also an eligible participant in the Parents Loan Undergraduate Students Program (PLUS), sometimes referred to as the Au iary Loan to Assist Students. The interest rate on the loan is 12% but change depending upon the fluctuation of the interest rate on U.S. Treas Bills. Repayment begins 60 days after the disbursement of the check. Parent dependent undergraduate students may apply for up to $3,000 per y Independent undergraduate students may apply for up to $2,500 per year un the PLUS and GSL programs combined. Graduate students may apply for u $3,000 per year. Students who intend to use the loan for payment of tuitio registration should submit an application no later than June 1.

Student Employment

The University participates in the College Work-Study Program. Inquir should be addressed to the Office of Student Financial Aid. In addition, Career Services Center maintains a registry of both full-time and part-ti positions available in the Washington area for undergraduate and gradu students.

After registration, students may apply at the Career Services Center interviews and referrals to positions for which they are qualified.

TERNATIONAL STUDENTS

ndergraduate international students with proven financial need who have mpleted one semester of full-time work (15 hours) at this University with a B erage are eligible to apply for the Board of Trustees Scholarships. Scholar- ips are awarded in the spring for the following academic year. See instruc- ns for applying for undergraduate financial aid, above.

Limited awards for graduate teaching assistantships and University fellow- ips are the responsibility of the chairman of the department or dean of the hool in which the degree is to be earned. Work as a teaching fellow requires cellent knowledge of English - both spoken and written.

Long-term loan funds for undergraduate and graduate international students e limited in amount and are available only to those foreign-born persons who ive established resident status in the United States through the Immigration nd Naturalization Service.

We suggest that students who wish to study in the United States have ailable sufficient funds to cover expenses for one full year before attempting enter a college or university. The cost at this University for one academic ear (September -May) is approximately $13,200. This estimate includes room nd board, tuition, books, clothes, and incidental expenses; no travel, holiday, r medical expenses are included.

ETERANS BENEFITS

he Veterans Benefits office, located on the third floor of Rice Hall, 2121 Eye t., N.W., assists students entitled to educational benefits as veterans or as idows or children of deceased or totally disabled veterans with any problems at may arise concerning their benefits. This Office also processes certification enrollment and attendance to the Veterans Administration so that educa- onal allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of eterans should consult with the veterans counselor prior to submitting pplication to the Veterans Administration. All such students should obtain e instruction sheet issued by the veterans counselor, which sets forth quirements to be fulfilled before certification of enrollment can be made to e Veterans Administration and that includes other information of general terest.

The Veterans Administration is at 941 N. Capitol St., N.E., Washington, D.C. 9421.

RIZES

Accounting Prizes—Three prizes for academic excellence awarded annually the Department of Accounting—two at the undergraduate level and one at Master of Accounting level.

Morris M. Aein Memorial Prize—Awarded to a deserving student for excel- ce in drawing.

Alpha Chi Sigma Prize—Awarded annually by the Alpha Pi Chapter to the dent who has attained the highest academic record in courses in chemistry. e name and year of graduation of the student is inscribed on a bronze plaque. e winner must have had at least 16 hours in chemistry, including the final nester at this University.

American Chemical Society Prize—Awarded to an undergraduate stud who has completed the junior year and who has demonstrated excellenc analytic chemistry.

American Institute of Chemists Prize—A medal awarded annually to graduating student majoring in chemistry who excels in scholarship, integ and leadership.

Department of Art Prizes—Two prizes—one for a senior in art history one for a senior in the fine arts—awarded annually to the most promis students, as determined by the departmental faculty.

Franz Bader Prize—Awarded to a student for excellence in art history criticism.

William C. Barbee Prize—Awarded to a deserving student for excellenc sculptural ceramics.

Perry Botwin Prize—Awarded annually to an outstanding senior in program in special education of the School of Education and Human Devel ment.

The Walter G. Bryte, Jr., Achievement Award—Provided by Walter G. Bry Jr., Colonel, U.S. Air Force (retired), first Professor of Air Science at Geo Washington University. The award is presented annually primarily to undergraduate residence hall, secondarily to any other activity at the Univ sity, that has shown, under the leadership of its elected or designated head, most improvement or excellence in its support of the principles and aims of United States of America and George Washington University. The hall or ot activity will be awarded a cash prize, and the name of its leader and the hall activity will be engraved on a silver trophy.

Buka Family Prize—Provided by Ruth Buka in honor of her parents, Geo and Rosa Buka, and her sister, Hilde Buka-Lacour. It is awarded to the mo outstanding student in the Department of Germanic Languages and Literatur

Byrne Thurtell Burns Memorial Prize—Awarded to the senior majoring chemistry who shows the greatest proficiency in organic chemistry, as e denced by a comprehensive examination, and who possesses such qualific tions of mind, character, and personality as to give promise of future achiev ment.

Business Administration Prize—Awarded annually by the Department Business Administration to the outstanding graduating senior in busine administration on the basis of scholarship, leadership and service to University.

Wilbur J. Carr Prize—Established in 1962 by Edith K. Carr, former Trustee the University, in memory of her distinguished husband, who was graduat from the School of Comparative Jurisprudence and Diplomacy in 1899. It awarded annually to that student in the graduating class of the University w has demonstrated outstanding ability in the study of international affairs a who has given evidence of possessing in marked degree the qualities th produce the good citizen and the dedicated public servant.

Chemical Rubber Company Freshman Chemistry Achievement Prize— *Handbook of Chemistry and Physics* awarded annually to the freshman stude who has demonstrated the greatest achievement in Chemistry 15–16.

Chemical Society of Washington Prize—Awarded to an outstanding unde graduate in the junior year who is majoring in Chemistry.

Astere E. Claeyssens Prize—Established in 1981 by the Trustees of the Be and Arthur Dick Family Foundation. It is awarded for the best original work playwriting by a student enrolled in the University.

rome Cornfield Memorial Prize—Awarded annually to the student who has tten the best Ph.D. dissertation in the Department of Statistics.

lertice Cornish Prize—Awarded annually to an outstanding student com- ting a graduate program in special education.

ohn Henry Cowles Prizes—Two prizes, established by John H. Cowles, ind Commander of the Supreme Council of Thirty-third Degree (Mother ncil of the World) of the Ancient and Accepted Scottish Rite of Free- sonry, Southern Jurisdiction of the United States of America. Awarded upon luation to the graduate or undergraduate student with the best overall olastic achievement in the School of Government and Business Administra- n and in the School of Public and International Affairs, respectively.

)eWitt Clinton Croissant Prize—Awarded annually to the undergraduate dent enrolled in a course in drama or active in University dramatics who mits to the English Department the best essay on drama or the theater.

.K. Cutter Prize—Established by Marion Kendall Cutter "for excellence in study of English." Awarded to the member of the graduating class whose ord in English, combined with general excellence, shows most marked itude for and attainment in English studies.

saac Davis Prizes—Established in 1847 and awarded annually to the three iors who have made the greatest progress in public speaking while enrolled the University. Awards are determined by a public-speaking contest in ich the participants deliver original orations. Only members of the senior ss of Columbian College of Arts and Sciences who are candidates for the gree of Bachelor of Arts or Bachelor of Science are eligible to compete.

)imock Gallery Prize—Purchase award presented for creative achievement the fine arts.

Henry Grattan Doyle Memorial Prize—Established in memory of Henry attan Doyle, a former Dean of Columbian College. Awarded annually to an tstanding senior for excellence in Spanish.

Elton Prize—Established by the Reverend Romeo Elton, of Exeter, England, d awarded annually to the student with the highest average in the most vanced course in the Greek language and literature.

Jesse Frederick Essary Prize in Journalism—Established by Helen Essary urphy and awarded annually to a student who has given promise of sound izenship and who submits the best printed and published evidence of ability "forthright reporting" and good journalistic writing in a student publication elsewhere.

Jessie Fant Evans Prize—A bequest of Joshua Evans, Jr., in 1971, in recogni- n of his wife's distinguished record at and service to the University, on ose Board of Trustees she served as the first woman member. Awarded nually to an outstanding senior student in a contemporary history course.

Joshua Evans III Prize in Political and Social Science—A memorial prize stablished by friends because of an outstanding life." Awarded annually to t student in the graduating class "who has demonstrated his/her signal ility in the social and political sciences and who has given promise of the erpretation of that ability in good citizenship among his/her fellows."

Willie E. Fitch Prize—Established by James E. Fitch in memory of his son. varded annually to a senior student for the best examination in chemistry.

Charles E. Gauss Prize—Established in honor of Charles E. Gauss, Elton ofessor of Philosophy form 1945 to 1964. Awarded annually to a graduating ior for excellence in philosophy.

Ginns Muth Company Prize—Awarded for creative achievement in the field visual communication.

Alice Douglas Goddard Prize—A memorial established by Frederick J Goddard, of Washington, D.C. Awarded annually to the senior student m the highest average in American literature.

Edward Carrington Goddard Prize—Established by Mary Williamson dard, Alice Douglas Goddard, and Frederick Joseph Goddard, of Washi D.C., in memory of Edward Carrington Goddard, class of 1881. Awarded junior or senior student making the highest average in the French languag literature.

Morgan Richardson Goddard Prize—A memorial established by Mary liamson Goddard, Alice Douglas Goddard, and Frederick Joseph Godda Washington, D.C. Awarded to the junior or senior student making the hi average in the following fields: business administration, economics, int tional business, or public accounting.

Gardiner G. Hubbard Memorial Prize in United States History—Establ by Gertrude M. Hubbard in memory of her husband and awarded annua that member of the graduating class majoring in history who has maint the highest standing in courses in United States history.

Human Services Program Prize—Awarded by the Department of Educ to a graduating senior in the Human Services Program who best exemplifi attributes of service to the profession and academic achievement wh student at the University.

International Business Prize—Two prizes awarded annually by the Sch Government and Business Administration to students specializing in int tional business, one awarded to a graduating senior and one awarded graduate student.

Elmer Louis Kayser Prize—Established by Paul and Elizabeth Rutheiser awarded annually by the Department of History for the best thesis in hi submitted by a candidate for the degree of Master of Arts.

David Lloyd Kreeger prizes in Art—Seven prizes given by Mr. Kreeger, fi the fine arts and two in art history (including museology). Fine arts prize awarded to a senior or graduate student in painting, sculpture, printma ceramics, and photography. One prize in art history is awarded to a senio one to a graduate student. Candidates for the prizes must submit ori papers or works of art. Winners are selected by distinguished representativ the field of art in the Washington, D.C., area.

Minna Mirin Kullback Memorial Prize—Established in 1968 by Solo Kullback in memory of his wife. Awarded annually by a committee of fa members of the Department of Statistics to a full-time undergradua graduate student majoring in statistics, who will have completed 18 sem hours of statistics courses by the end of the spring semester.

John Francis Latimer Prize in Classics—Established in 1973. Awarded graduating senior who has made the most outstanding record as a major i Department of Classics.

Hilda Haves Manchester Prize in Sociology—Established in honor of H Haves Manchester, B.A. 1932, an outstanding student whose major field sociology. Awarded annually by Columbian College of Arts and Sciences t senior student majoring in sociology who has the highest scholastic reco

Vivian Nellis Memorial Prize—Awarded to a student in the English De ment who has shown special promise in the field of creative writing.

Phi Delta Kappa Prize—Awarded annually by the George Washin University Chapter to an outstanding senior in a teacher education progra the School of Education and Human Development.

hi Delta Kappa Research Prize—Awarded annually by the George Washing-
University Chapter to a graduate student, for an outstanding research
ject.

Phi Eta Sigma Prize—A choice book selected from the field of the recipient's
or, awarded annually by the George Washington University Chapter to the
dent attaining the highest scholastic average in the first full semester of
k. The winner's name is engraved on a plaque in the Office of the Dean of
lumbian College of Arts and Sciences.

Pi Lambda Theta Prize—Awarded annually by Alpha Theta Chapter to an
standing senior in a teacher education program in the School of Education
Human Development.

Psi Chi Prizes—Two prizes awarded annually by the George Washington
iversity Chapter to the best undergraduate student in experimental psychol-
and to the M.A. degree candidate or second-year graduate student submit-
the best thesis or research project in psychology.

Ruggles Prize—Established by Professor William Ruggles in 1859, awarded
nually to a candidate for a bachelor's degree for excellence in mathematics.

The Jack and Anne Ryan Award in Health Services Administration—
arded annually to that Health Services Administration student who dis-
ys excellence of analysis and writing skills in the preparation of a paper on a
pic in health services administration.

Hermann and Johanna Richter Schoenfeld Prize—Established in grateful
preciation of the inspired teaching and devotion to his students of Dr.
rmann Schoenfeld, who for more than 20 years until his death in 1926
aded the Department of German. Hermann Schoenfeld, Ph.D., LL.D., was
idely recognized as a scholar of distinction whose presence on the faculty
ded prestige to the University. This prize is given annually to a member of
graduating class for excellence in historical and cultural phases of German
udies.

School of Public and International Affairs Alumni Association Prize—May
awarded annually to a graduate of the School of Public and International
ffairs (graduate or undergraduate degree recipient) who, in the opinion of the
ean and the Faculty, deserves recognition for academic achievement and
ntribution to the life of the George Washington University and its programs
d goals.

Julian H. Singman Prize—Awarded for creative achievement in the field of
sign.

Society of Colonial Wars in the District of Columbia Prize—A cash prize
arded to a candidate for a graduate degree who, in the judgment of the
culty of the Department of History, submits a thesis or dissertation demon-
rating excellence in historical research in American Colonial history. The
niversity reserves the right to withhold the award if no thesis or dissertation
taining the required degree of excellence is submitted.

Staughton Prize—Established by the Reverend Romeo Elton and awarded
nually to the student making the best record in the most advanced courses in
e Latin language and literature.

Alfred E. Steck Memorial Prize—Awarded for proven excellence in the field
sculpture.

James MacBride Sterrett, Jr., Prize—Established in 1911 by Professor Sterrett
memory of his son. Awarded annually to the student who obtains the highest
verage in Physics 1 and 2.

Charles Clinton Swisher Historical Club Prize—Established in 1936 by the
harles Clinton Swisher Historical Club and augmented in 1941 by the bequest

of Professor Swisher. Awarded annually to the student who submits th essay covering some phase of medieval history.

James H. Taylor Graduate Mathematics Prize—Established in memo James H. Taylor, former Professor of Mathematics at the University. Aw annually to a graduate student for outstanding performance in mathema

Geza Teleki Prize—Awarded for outstanding work in the geological scie

Patricia M. Toel Memorial Prize—Awarded annually to a graduate stud photography to recognize outstanding achievement.

Benjamin D. Van Evera Memorial Prize—Awarded annually to that Gra Teaching Fellow in Chemistry selected as the most effective teacher duri current academic year.

The Wall Street Journal Leadership Prize—Awarded annually to a gradu senior with a major field of study in finance within the Bachelor of Bus Administration degree, for outstanding academic performance and serv the University.

Thomas F. Walsh Prize—Established in 1901 and awarded annually t student who submits the best essay in Irish history.

Alexander Wilbourne Weddell Prize—Established in 1923 by Virginia Weddell in memory of her husband. Awarded annually to a degree cand who writes the best essay on "the promotion of peace among the nations world." The prize essays shall become the property of the University and not be printed or published without the written consent of the University University reserves the right to withhold the award if no essay attainin required degree of excellence is submitted.

REGULATIONS

Students enrolled in the University are required to conform to the follo regulations and to comply with the rules and regulations of the college, sc or division in which registered.

Students who withdraw or are suspended, or who, for any other reaso not registered at the University for one semester or more, may re-ente continue work only under the regulations and requirements in force at the of return.

If a student knowingly makes a false statement or conceals material info tion on an application for admission, registration card, or any other Univ document, the student's registration may be canceled. If such falsificati discovered after the student has established an academic record at the U sity, the student may be subject to dismissal from the University. Su student will be ineligible (except by special action of the Faculty) for s quent registration in the University.

STUDENT STATUS

For the purpose of defining student status, undergraduates taking 12 or semester hours and graduates taking 9 or more semester hours are consider be full-time students. All other students are considered to be part time.

TENDANCE

dents may attend only those classes for which they are registered. Regular ndance is expected. Students may be dropped from any course for undue ence.

HOLARSHIP REQUIREMENTS

dents who fail to maintain the scholarship requirements of the college, ool, or division in which registered may be dismissed from the University.

ades

ades are mailed to students through the Office of the Registrar at the close of h semester. They are not given out by instructors.

DERGRADUATE

e following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, w Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, authorized Withdrawal; *P*, Pass; *NP*, No Pass. Except for courses that ecifically state that repetition for credit is permitted, a candidate for a degree this University may not repeat a course in which a grade of *D* or better was eived, unless required to do so by the department concerned. A written tement, indicating that the student is required to repeat the course, must be bmitted to the student's dean by the appropriate department chairman.

ADUATE

e following grading system is used: *A*, Excellent; *B*, Good; *C*, Minimum Pass; , Credit; *F*, Fail; *I*, Incomplete; *IP*, Progress; *P*, Pass; *NP*, No Pass; *W*, thorized Withdrawal; *Z*, Unauthorized Withdrawal. Except for courses that ecifically state that repetition for credit is permitted, a candidate for a degree this University may not repeat a course in which a grade of *C* or above was eived, unless required to do so by the department concerned. A written tement to this effect must be submitted to the student's dean by the propriate department chairman.

COMPLETE/AUTHORIZED WITHDRAWAL

hen another grade has not been assigned, the symbol *I* (Incomplete), the mbol *W* (Authorized Withdrawal), or the symbol *Z* (Unauthorized Withdraw-) will be recorded. The symbol *I* indicates that a satisfactory explanation has en given the instructor for the student's inability to complete the required ork of the course. At the option of the instructor, the grade of *I* may be corded if a student, for reasons beyond the student's control, is unable to mplete the work of the course, and if the instructor is informed of, and proves, such reasons before the date when grades must be reported. The ade may be used only if the student's prior performance and class attendance the course have been satisfactory. Any failure to complete the work of a urse that is not satisfactorily explained to the instructor before the date when ades must be turned in will be graded *F*. If acceptable reasons are later esented to the instructor, that instructor may initiate an appropriate grade ange. The grade of *Z* is assigned when students are registered for a course at they have not attended and in which they have done no substantial graded ork.

REMOVING AN INCOMPLETE

For information concerning the removal of a grade of Incomplete fr
student's record, consult the regulations of the college, school, or div
concerned.

THE QUALITY-POINT INDEX

Scholarship is computed in terms of the quality-point index, obtain
dividing the number of quality points by the number of semester hou
which the student has registered, both based on his or her record in
University. Quality points are computed from grades as follows: *A*, four p
B, three points; *C*, two points; *D*, one point; F, no points, for each semester
for which the student has registered. Courses marked *CR*, *I*, *IP*, *P*, *NP*, *W*
are not considered in determining the index, except that courses marked
be considered when a final grade is recorded. With the exception of Co
tium courses, grades in courses taken at other institutions are not consider
computing the quality-point index.

Final Examinations

Final examinations for undergraduate courses are scheduled by the Offi
the Registrar. Examinations for courses numbered 201 or above are sched
if desired, by the individual department or instructor.

Academic Dishonesty

The University community, in order to fulfill its purposes, must establish
maintain guidelines of academic behavior. All members of the communit
expected to exhibit honesty and competence in their academic work. Inco
students have a special responsibility to acquaint themselves with, and
use of, all proper procedures for doing research, writing papers, and t
examinations.

Members of the community will be presumed to be familiar with the p
academic procedures and held responsible for applying them. Delib
failure to act in accordance with such procedures will be considered acad
dishonesty. Acts of academic dishonesty are a legal, moral, and intelle
offense against the community and will be prosecuted through the p
University channels.

Copies of the University policy on academic dishonesty can be obtained
the following officers: all department chairmen, all academic deans
Registrar, and the Vice President for Academic Affairs.

STUDENT CONDUCT

All students, upon enrolling and while attending The George Washin
University, are subject to the provisions of the *Statement of Student Rights*
Responsibilities, which outlines student freedoms and responsibilitie
conduct, the Judicial System for Nonacademic Student Discipline, and
policies and regulations as adopted and promulgated by appropriate Unive
authorities. Copies of these documents may be obtained at the Office of the
President for Student Affairs. Sanctions for violation of these regulations
include permanent expulsion from the University, which may make en
ment in another college or university difficult. Regulations or requirem
applicable only to a particular program, facility, or class of students may n

lished generally, but such regulations or requirements shall be published in anner reasonably calculated to inform affected students.

THDRAWAL

hdrawal from a course or from the University requires the permission of the n of the college, school, or division in which the student is registered. mission to withdraw from the University will not be granted a student who s not have a clear financial record (see Payment of Fees).

ach college, school, and division of the University sets deadline dates for h semester concerning withdrawal. Withdrawal between these dates and the of the semester is permitted only in exceptional circumstances.

All charges for courses dropped without the approval of the dean must be t by the student. Such unauthorized withdrawal will result in the recording a grade of Z for the course or courses.

ANGES IN PROGRAM OF STUDY

Changes Within a College, School, or Division—A student may not substitute e course for another, drop courses (see Withdrawal, above), or change status m credit to audit or from audit to credit without the approval of the dean of college, school, or division in which registered.

Change from one section to another of the same course may be made with the proval of the dean and the department concerned.

Change from one major field to another within the same college or school y be made with the approval of the dean.

Transfer Within the University—Application for transfer to another college, hool, or division must be made to the appropriate admitting office on the rm provided by the office concerned. Transfer from the appropriate pre-ofessional curriculum in Columbian College to bachelor's degree candidacy the School of Public and International Affairs may take place upon mpletion of 60 or more semester hours of course work and the necessary ocedures required by the particular school.

With the exception of the School of Government and Business Administra-on, which limits a student to 15 semester hours earned in nonmatriculated atus, a maximum of 45 semester hours earned in the Division of Continuing ducation and Summer Sessions may be applied toward a bachelor's degree in e other degree-granting colleges or schools of the University.

Students transferring within the University are advised to study carefully the quirements listed below under Graduation Requirements and to note that nless otherwise specified, in all undergraduate divisions, 30 semester hours, cluding at least 12 semester hours in the major field, must be completed hile registered in the school or college from which the degree is sought. Upon ansfer the student should consult the dean concerned and understand clearly e requirements that must be fulfilled.

REDIT

redit is given only after registration for a course and satisfactory completion f the required work, or upon the assignment of advanced standing in ccordance with the regulations of the several colleges, schools, and divisions.

Auditing—A person who has been admitted to the University may be egistered, with the permission of the instructor, as an auditor in a class (no cademic credit). An auditor is not required to take active part or to pass

examinations. A student who takes a course as an auditor may not repeat it for credit.

POST-ADMISSION TRANSFER CREDIT

Students who plan to attend another institution and apply credit so ea toward graduation from this University must first secure the written app of their dean. In no event will credit in excess of what might be earned similar period in this University be recognized.

TRANSCRIPTS OF RECORD

Official transcripts of student records are issued on written request of student or former student who has paid all charges, including any student installments, due the University at the time of the request. A fee of $ charged for each transcript. When more than two transcripts are ordered a same time, a $2 fee is charged for each of the first two transcripts and a 50 is charged for each additional transcript. Partial transcripts are not issued

CONTINUOUS ENROLLMENT

Once entered in a degree program, a student is expected to be continuo enrolled and actively engaged in fulfilling the requirements for the degree semester of the academic year until such time as the degree is confe Should the student break continuous enrollment at the University and request and be granted a leave of absence (see below) or be assigned by the to inactive status (see below), he or she must apply for readmission an granted, be subject to the requirements and regulations then in force.

LEAVE OF ABSENCE

Should a degree student find it necessary to interrupt active pursuit of degree, he or she may petition the dean for a leave of absence for a spe period of time, generally limited to one calendar year. A degree student discontinues active enrollment in degree studies without being granted a le of absence, or a student granted a leave who does not return to active stud the close of the period of approved absence, must apply for readmission an subject to the regulations and requirements then in force. No fees are asse students while on leave of absence.

INACTIVE STATUS

Under the regulations established by each school and college, a student ma considered in continuous pursuit of the degree while not enrolled in course the University when engaged in the following: cooperative engineering w semester; study abroad program; attendance at another institution with p approval to have work transferred back to the GWU program; completion outstanding work in courses in which a grade of Incomplete was received non-course instructional activities unique to the particular school or colle

Students must request to be enrolled in inactive status, in advance of the or semester concerned, and be granted approval by their dean for the spe activity desired. This status is generally limited to one year; no fees assessed students while in this status.

RADUATION REQUIREMENTS

egrees are conferred in February, May, and September.

To be recommended by the Faculty for graduation a student must have met ne admission requirements of the college or school in which registered; ompleted satisfactorily the scholarship, curriculum, residence, and other equirements for the degree for which registered; and be free from all indebted-ess to the University. Enrollment is required for the semester or summer ession at the close of which the degree is to be conferred.

Application for Graduation—An Application for Graduation form must be led at the time of registration for the last semester or summer session of the enior or final year. Students completing degree requirements during the ummer sessions will be awarded diplomas (no formal convocation) dated eptember 30, *provided* they have completed all degree requirements and have pplied for graduation as a part of registration for the summer sessions.

Scholarship—The student must meet the scholarship requirements for the articular degree for which registered.

Curriculum—Minimum curriculum requirements for each degree are stated nder the college or school offering work in preparation for the degree.

Residence—Unless otherwise specified, in all undergraduate divisions of the niversity, a minimum of 30 semester hours, including at least 12 hours in the najor field, must be completed while registered in the school or college from vhich the degree is sought. This requirement applies to students transferring vithin the University as well as to students transferring from other institutions. Unless special permission is granted by the dean of the college or school oncerned to pursue work elsewhere, the work of the senior or final year must e completed in the college or school from which the degree is sought.

The graduate student must meet the residence requirements for the particular legree for which registered.

Attendance and Conduct—The University reserves the right to refuse to confer a degree upon a candidate whose attendance or conduct has been nsatisfactory.

Thesis or Dissertation—A thesis or dissertation submitted in partial fulfill-nent of requirements for a degree must be presented in its final form to the lean of the college or school concerned no later than the date specified in the niversity Calendar.

Accepted theses and dissertations, with accompanying drawings, become the roperty of the University and are deposited in the University's Gelman ibrary, where the duplicate copies are bound and made available for circula-ion. See the appropriate college or school in this *Bulletin* for regulations overning theses and dissertations.

HONORS

WITH DISTINCTION

n all undergraduate divisions of the University, a bachelor's degree may be conferred "With Distinction," at the discretion of the faculty, if a student meets he specific requirements of the college or school as follows:

1. Columbian College of Arts and Sciences or School of Public and Interna-ional Affairs—the attainment of the grades of *A* in 60 percent of the courses aken at GWU; or
2. School of Education and Human Development or School of Government

and Business Administration—the attainment of a quality-point index of 3 or higher in all course work taken at GWU.

To be eligible a student must have completed at this institution at least o half of the courses required for the degree.

SPECIAL HONORS

Special Honors may be awarded by the faculty to any member of the graduat class for outstanding achievement in the student's major field on recommen tion of the major department. The student must fulfill all of the follow requirements:

1. Candidacy for Special Honors must be approved by the faculty mem representing the major department or field not later than the beginning of senior year.

2. Such other conditions as may be set at the time the candidacy is appro must be met.

3. At least one-half of the courses required for the degree must have b completed at GWU.

4. The specific requirement of the college or school in which registered m be fulfilled as follows: (a) Columbian College of Arts and Sciences or the Sch of Public and International Affairs—grades of *A* or *B* in 50 percent of courses taken at GWU; (b) the School of Education and Human Developmen the School of Government and Business Administration—a quality-point in of at least 3.0 on all course work taken at GWU.

THE LIBRARY

All students registered in the University have the privilege of using University's Gelman Library. Its stacks are open, and all students are welco to browse. A card denoting approved enrollment for the current semester m be presented when books are borrowed for outside use.

The loan period for stack books is 21 days. Any book that circulates is sub to recall by the library if needed for reserve or other use. Reserve books must used in the reserve reading room when the library is open, except that they m be withdrawn for overnight use beginning at 8:30 p.m. Transcripts of grades withheld until a student's library record is clear, with all borrowed bo returned and any fines paid.

All students using the University's Gelman Library are expected to be fami with its detailed regulations, available at any of the library's service desks.

RIGHT TO DISMISS STUDENTS

The right is reserved by the University to dismiss or exclude any student fr the University, or from any class or classes, whenever, in the interest of student or the University, the University Administration deems it advisab

RIGHT TO CHANGE RULES

The University and its various colleges, schools, and divisions reserve the ri to modify or change requirements, rules, and fees. Such regulations shall into force whenever the proper authorities may determine.

RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs with notice whenever circumstances warrant such changes.

NIVERSITY POLICY ON THE RELEASE OF STUDENT INFORMATION

ıe Family Educational Rights and Privacy Act of 1974 applies to institutional licies governing access to and release of student education records maintained by educational institutions that are recipients of federal funds. The niversity complies with this statute, which states, in part, that such institutions must

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as accurate, misleading, or otherwise inappropriate;
3. receive students' written consent before releasing information from their ucation records to persons outside the University, except as provided by the ct and except for directory information as indicated below (information may furnished to a student's parents without such written consent only upon rtification of the student's financial dependency); and
4. comply with a judicial order or lawfully issued subpoena to release a udent's record, notifying the student of this action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of n; dates of attendance; school, college, or division of enrollment; field of udy; credit hours earned; degrees earned; honors received; participation in ganizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height and weight of members of hletic teams. A student who does not wish such directory information leased must file written notice to this effect in the Office of the Registrar at the ginning of each semester.

Copies of the University's full policy statement on the release of student formation may be obtained from the Office of the Registrar.

ROPERTY RESPONSIBILITY

he University is not responsible for the loss of personal property. A Lost and ound Office is maintained on campus in the Safety and Security Office.

NIVERSITY POLICY ON DRUGS

he University cannot condone violations of law, including violation of those ws that proscribe possession, use, sale, or distribution of drugs. Members of ıe academic community should know that administrative action, which may ıclude dismissal from the residence halls, revocation of other privileges, or ıspension or dismissal from the University, may be taken in order to protect ıe interests of the University and the rights of others.

ASSOCIATIONS AND SERVICES

CONSORTIUM OF UNIVERSITIES OF THE WASHINGTON METROPOLITAN AREA, INC.

even universities in the Washington area—American University, Catholic Jniversity of America, George Washington University, Georgetown University, Howard University, the University of the District of Columbia, and the

University of Maryland—are associated in a Consortium through which th coordinate the use of their respective facilities; Gallaudet College, Mo Vernon College, and Trinity College are associate members of the Consorti Students in approved programs leading to degrees in any one of th institutions have the opportunity to select from the combined offerings particular courses that best meet their needs.

Participation is limited to degree candidates. The following, however, excluded: students in canon law, dentistry, medicine, and theology. students are also excluded from participation, except for candidates for degree of Master of Laws at George Washington University and Georgeto University.

In special courses involving private instruction (such as music or art tutorial study, if a special fee is charged, this fee is not covered by Consortium agreement and must be paid by the individual student to institution administering the course.

Students are encouraged to study the program announcements of all par pating institutions. See Registration for information concerning registration Consortium courses.

Registration forms and instructions are available from the registrar of institution in which the student is enrolled. Students register and pay tuitio their own institutions for all Consortium courses; course fees are payable to visited institutions.

THE READING CENTER

Director F.E. Hesser

The Reading Center offers individual diagnostic and corrective services fo levels: primary, elementary, secondary, and adult. Special reading impr ment classes are conducted for high school and college students as we other adults. There is also an After-School Program designed for academic gifted children. Instruction is available on an individual, semi-individual, small-group basis.

A complete diagnosis includes psychological tests; vision, hearing, d nance, and spelling tests; and various types of reading achievement aptitude tests. Results are interpreted, and a written report is presente conference with the parents or the individual.

The special reading improvement classes for high school students, col students, and other adults are offered throughout the year at stated inter Emphasis is placed on improvement of vocabulary, speed, comprehension, study skills. Instruction in spelling is also provided as needed.

Fees—Individuals should contact the Center regarding the fee schedule. fees are payable in advance at the Reading Center, Building C, Suite 429, G St., N.W.

THE SPEECH AND HEARING CENTER

The George Washington University Speech and Hearing Center prov diagnosis and treatment of a wide range of speech, language, and hea disorders. These include developmental impairments of articulation language, stuttering, voice disorders, and speech and language impairm resulting from neurological damage. Evaluation and aural rehabilitation also provided for hearing-impaired individuals. The Speech and Hea Center operates in conjunction with the Department of Speech and Hearin

HE WRITING LABORATORY

rector Margaret Morrison

he Writing Laboratory, a University facility administered by the English epartment and Columbian College, offers a free tutorial service to George ashington University students who need help with basic writing skills and ith writing projects ranging from compositions and research papers to sumes, applications, and business letters. The lab also offers a series of mini-urses on grammar, diction, style, the taking of essay exams, and a variety of her subjects. The Writing Laboratory is located in Stuart Hall, Room 201A.

ENTER FOR ACADEMIC AND ADMINISTRATIVE COMPUTING

irector F. William Rambo

he Center for Academic and Administrative Computing (CAAC) is located in e Academic Center, 801 22nd St., N.W. CAAC facilities are normally ailable 24 hours a day during the academic year, to all faculty, staff, and udents.

CAAC encourages interest in computers by providing computing facilities d by offering short courses and technical assistance. Any University student ay have access to the computer facilities for individual research, class ojects, and thesis or dissertation study. Access is by request; the schedule of arges is available at CAAC.

CAAC maintains an IBM 4381 and two IBM 4341s (VM/SP and OS/VS1). A ll range of compilers and application software packages is available, includ-g (but not limited to) CMS, XEDIT, FORTRAN, COBOL, PL/1, PASCAL, APL, PSS, SAS, BMDP, ASSEMBLER, ASSIST, and SCRIPT. In addition, CAAC ovides a variety of public terminals and microcomputers.

Computer programming courses are offered by the School of Government and usiness Administration, the Department of Statistics/Computer and Informa-on Systems, and the School of Engineering and Applied Science. In addition, any other departments offer courses that utilize the computer as a research djunct to course work. In general, additional fees are charged for computer se.

LUMNI RELATIONS OFFICE

irector Sandra Hunter Lear

he Alumni Relations Office, in conjunction with the General Alumni Associa-on, makes available to alumni and their families an annual program of rvices and educational and cultural events. Students are invited to partici-ate in the programs held on campus. In addition, the Alumni Relations Office ponsors or co-sponsors programs and services designed specifically for the tudent body.

Alumni are encouraged to inquire about available services and programs at e Alumni Relations Office and to keep the Office informed of any changes in ldress or occupation.

The Alumni Relations Office is located in Alumni House, 714 21st St., N.W., eorge Washington University, Washington, D.C. 20052.

GENERAL ALUMNI ASSOCIATION

President John R. Manning

The objectives of this association are to unite the graduates who wish associate themselves for charitable, educational, literary, and scientific p poses, and to promote the general welfare of the University.

Membership in the Association is conveyed automatically to anyone who been graduated from any school or division of the University. Anyone who earned 15 credit hours or the equivalent at the University and whose class graduated is eligible for membership; in the case of the Division of Continu Education and Summer Session students, however, only the "15 credit ho earned" requirement and not the "graduation of the class" requirement appl Graduates of certificate programs of the Center for Continuing Education Washington are eligible. Any persons who are members of the Universi Board of Trustees, faculty, or administrative staff, as well as others determi to qualify by the Governing Board, are eligible for membership in the Asso tion.

The affairs of the Association are directed by a Governing Board, the majo of whose members represent the constituent alumni of the University's scho and colleges.

The voluntary leadership of the Association works closely with the sta the Alumni Relations Office in carrying out Association affairs. The Asso tion may be contacted through the Alumni Relations Office.

ROTC

George Washington University students may enroll through the Consortiu the Army ROTC program offered at Georgetown University, the AFRO program at the University of Maryland, or the Army ROTC or AFROT Howard University. Those interested should contact the ROTC enrollm officer at one of these universities. Limited credit for such courses (prima advanced ROTC) may be assigned for electives to meet degree requirement George Washington University; prior approval is required by the dean of school in which the student is enrolled.

See Courses of Instruction for the NROTC program at George Washing University.

STUDENT LIFE

Vice President for Student Affairs William Smith, Jr.
Assistant Vice President for Campus Life John Perkins

The Office of the Vice President for Student Affairs develops student services, policies, and procedures to complement the University's for instruction program. These activities are implemented through the office the Cloyd Heck Marvin Center, Counseling Center, Dean of Students, Edu tional Opportunity Program, Housing and Residence Life, International vices, Services for Students with Disabilities, Student Activities, Career vices Center, and Student Health Service.

FFICE OF THE DEAN OF STUDENTS

ean of Students Gail Short Hanson
ssistant Dean of Students Cheryl Beil
ssistant Dean, Educational Services Linda Donnels

he Office of the Dean of Students provides counseling and information for udents and assists in program development for the Division of Student ffairs. Staff members are well informed on University policies and the various udent services provided on campus, enabling them to provide referrals and nswers to many questions concerning general student life. Personal letters of ecommendation for students applying to graduate and professional schools an be obtained from this office. The Dean of Students is responsible for the ervices and programs offered by the Counseling Center, Educational Opportuity Program, International Services, Services for Students with Disabilities, tudent Health Service, and Career Services Center. The Dean of Students' ffice is located on the fourth floor of Rice Hall.

ounseling Center

irector E. Lakin Phillips
ssistant Director Diane M. DePalma

he Counseling Center fosters personal growth and development and helps ndividuals with personal, social, career, and study problems that interfere ith their educational goals. University students, staff, and faculty are eligible or services. These include (1) short-term individual counseling, psychotherpy, and art therapy for personal problems (e.g., academic pressures, relationhip issues, family problems, concerns about sex, self-esteem); (2) group ounseling for personal problems and special focus problems; (3) educational/ ocational counseling and assessment to facilitate choices of majors and areers; (4) workshops designed to facilitate students' learning about themelves and developing new ways of interacting with others (e.g., assertiveness raining, stress management, relationship skills, and study skills seminars); (5) onsultation with faculty, staff, and student groups about their special needs in esigning programs to improve the campus environment.

The Center administers the Miller Analogies Test, GWU admissions tests, nd special assessments for business and industry. Its Community Vocational ounseling Services provides educational/vocational counseling to GWU lumni and the greater Washington community.

Students, staff, and faculty may schedule a cost-free initial interview from a.m. to 4:30 p.m., Monday through Thursday, and from 1 to 4:30 p.m on ridays. For most services a modest fee per appointment is charged. An dditional materials fee is charged for test batteries. Fee adjustments can be ade if financial need is a factor. Disabled students are asked to call ahead so hat arrangements can be made to adapt services or to meet at an accessible site. The Counseling Center is located at 718 21st St., N.W.

nternational Services

Director Patricia J. McMillen
Advisor F. Joy Montero

nternational students, scholars, faculty, and staff are provided assistance hrough International Services. The staff offers immigration assistance and nformation on government requirements and regulations specific to the

international community; orientation programs to help with adjustment living and studying in the United States; and advising and counseling f variety of personal problems, including cultural adjustment, living conditi budgets, academic concerns, and financial aid. International Services is loc at 2129 G St., N.W.

Educational Opportunity Program

Director Ronald A. Whitmore
Assistant Director Donald L. Ross

The Educational Opportunity Program (EOP) provides selected Distric Columbia residents with financial aid, academic support services, and pers advising to assist them in pursuing undergraduate work at George Washing University. The EOP staff coordinates a precollege program as well as ed tional and cultural activities to promote the success and enhance the exp ence of program participants.

The EOP staff administers the High School/College Internship Prog (HI/SCIP), which enrolls highly motivated District of Columbia high sc seniors. Participants enroll at GWU as nondegree candidates, taking a m mum of 6 credit hours per semester in addition to their high school curricu Application to the HI SCIP program is made through the student's high sc guidance office. Counseling and advising is provided by the EOP staff. HI/S students have access to all of the academic support services available to participants. The Educational Opportunity Program is located at 2127 G N.W., Room 101.

Services for Students with Disabilities

Assistant Dean, Educational Services Linda Donnels
Coordinator Christy Willis

The Office of Services for Students with Disabilities works to assure tha special services necessary for handicapped students to participate fully in academic programs and the extracurricular life of the campus are provide them through University or community resources. The office is located o fourth floor of Rice Hall.

Career Services Center

Director Kathy Sims
Assistant Directors Ken Everingham, Marva Gumbs

The Career Services Center provides career planning and job-seeking a tance to students and alumni. Programs and services include full-time and time job vacancy listings; career counseling; workshops (e.g., organizing searches, resume and letter writing, effective interviewing, negotiating salary); a resource library of career field and employer literature; on-ca interviews for students within one year of graduation; a resume referral ser resume critiques; a call-in job listings service, Jobline; and a credentials se that supports employment and graduate/professional school applications. Center is located in the Academic Center, Suite T-509, 801 22nd St., N.W

nt Health Service

tor Isabel Kuperschmit, M.D.
dinator Janet Garber

Student Health Service is an outpatient clinic located in the H.B. Burns orial Building at 935 22nd St., N.W.
e Health Service is staffed by physicians, nurse practitioners, and physi- assistants who are capable of addressing most of students' medical lems. Visits are cost-free and may be either arranged by appointment or, g certain hours, secured on a walk-in basis. Many routine laboratory tests be performed in the Health Service lab at cost. Allergy shots, immuniza- , and various lab tests are done at little or no charge. Psychiatric ation, crisis intervention, and short-term therapy are available by appoint- .

r serious emergencies occurring during hours when the Student Health ice is closed, students may go to the Emergency Room of the University ital for treatment. All fees are the responsibility of the student.
udents must be currently enrolled on campus in the University to receive ment at the Student Health Service. Students enrolled in off-campus rams and the Continuing Engineering Education Program are not eligible. bills incurred from all services rendered outside of the Student Health ice (for example, x-ray work, laboratory work, and office visits to private icians) are the responsibility of the student.

LTH AND ACCIDENT INSURANCE

University has arranged for and endorsed group health and accident rance, on an elective basis, for all students. Interested students should act the Student Health Service or Office of the Dean of Students.

USING AND RESIDENCE LIFE

ctor Ann Webster
ociate Director David McElveen
stant Directors Kathleen Jordan, Sherri McGee, Rebecca Griffin

plete information concerning the University's residence halls is available the Director of Housing and Residence Life, George Washington Univer- Washington, D.C. 20052. Information concerning off-campus housing near University may also be obtained at this Office.
dmission to the University does not include a room reservation. The lent will receive, with the notification of acceptance, University residence information, an application for residence hall space or apartment accom- lation, and a declaration of intent to attend the University. The application residence hall space or apartment accommodation must be accompanied by 00 nonrefundable deposit. The housing deposit is credited toward the first ester's room or apartment charge. Rooms and apartments are leased for the demic year, and lease payment must be made in early June for the fall ester, unless the student elects the deferred payment plan or the 10-month ment plan. Please check with Housing and Residence Life for the deferred ment plan and with the Student Accounts Office for the 10-month payment n.

1985–86 Residence Hall Rates per Person for Two Semesters*

For Men:
Calhoun Hall
double room
triple room

For Women:
Strong Hall
single room
double room
triple room

For Men and Women:
Crawford Hall
double room
Everglades Hall*† (limited to juniors and seniors)
apartment for two persons 2,800
Guthridge Hall* (limited to juniors and seniors)
apartment for one person 2,920
apartment for two persons
apartment for three persons
Building JJ (limited to sophomores, juniors, and seniors)
apartment for four persons
apartment for six persons
Francis Scott Key Hall (limited to juniors and seniors)
apartment for one person
apartment for two or three persons
Madison Hall
double room
triple room
Milton Hall*† (limited to juniors and seniors)
apartment for two persons 2,800
apartment for three persons
Mitchell Hall
single room
Munson Hall*† (limited to juniors and seniors)
apartment for two persons 2,800
apartment for three persons
Thurston Hall
double room, triple room, room for four or five

Food Service‡

Resident freshmen and sophomores are required to choose one of the fo three food service plans: the seven-day, 19 meals per week plan, at th $1,838 for the academic year; the any 14 meals per week plan for $1,76 academic year; or the any 10 meals per week plan at $1,716 for the a year. Participation in the food service plans is optional for junior, sen graduate students, and for all students assigned to apartments. Food payment does not cover University intersession or vacation periods. A

* Residence hall prices and allocation are subject to change.
* Residents must deal directly with the telephone company and pay all costs associ telephone service.
† Residents must pay electricity bills (which do not include the cost of heating) in ad the stated rate.
‡ Food service prices are subject to change.

s admit bearer to dining rooms in Thurston and Mitchell Halls and to the nd-floor contract dining room in the Cloyd Heck Marvin Center. Meal s may also be used on a cash-equivalency basis in the Marvin Center first- cafeteria and George's.

udents who observe the Jewish dietary laws can write to make arrange- ts with the GW Housing and Residence Life Office regarding the B'nai h Hillel Foundation Kosher Meal Plan.

OYD HECK MARVIN CENTER

ector Boris Bell
istant Director Donald Cotter

Cloyd Heck Marvin Center serves as the campus community center, viding services, conveniences, and recreational and social opportunities for dents, faculty, staff, alumni, and guests. Its wide range of facilities provides setting for a variety of programs conducted by the University Program rd, by the academic departments that include performing arts, and by other dent and faculty organizations.

he Center Governing Board, representative of all segments of the University mmunity, plays an important role in the functioning of the Center by king closely with the full-time staff in the development of the procedures policies that provide a framework for the Center's operation.

UDENT ACTIVITIES OFFICE

ector Claudia Derricotte
istant Directors Michael Elmore, Randall Mason

Student Activities Office assists individual students and organizations in gram development, campus leadership development, and participation in cial projects, within both the University community and the community at e. The Office serves as a clearinghouse for activities information, registers advises student organizations, and informs the University community of vities and programs through monthly and annual publications. The Student ivities Office is also responsible for coordinating the orientation program for students and for planning supplemental development programs for duate and undergraduate students. Students who want to participate in the acurricular phases of University life should acquaint themselves with the lities and staff of the Student Activities Office.

dditional information about the numerous student organizations and mittees is contained in the *Student Handbook*, compiled by and available ne Student Activities Office in the Marvin Center.

dent Government

George Washington University Student Association is comprised of all time and part-time graduate, professional, and undergraduate students are registered for academic credit on campus. A body of elected and pointed individuals is responsible for representing the interests of students he University. The Student Association provides various services for dents, such as an academic evaluation, a student directory, and the Student ocate Service. Further information can be obtained from the Student ociation offices in the Marvin Center.

Student involvement in the governance of the University is also p through participation in various administrative and Faculty Senate c tees, advisory councils of the schools and colleges, selected committee Board of Trustees, and specialized bodies, such as the Residence Hall A tion, the Joint Food Services Board, and the Marvin Center Governing This involvement has helped develop policies and programs benefi students and to the total University community.

Student Organizations

Students are encouraged to become involved with existing student or tions or to initiate their own. There are approximately 200 organizati campus covering a broad spectrum of interests, including academic, sional, international, cultural, political, service, sports, hobbies, recrea religious, and meditative, as well as social fraternities and sororities. Aca honor societies include Phi Beta Kappa and Sigma Xi.

RELIGIOUS LIFE

The University recognizes the contribution that religion makes to the li students and encourages them to participate in the various religious or tions of their own choice. Catholic, Jewish, and Protestant bodies s various groups and form a link between the University and the r community. The advisors of the religious organizations are availa counseling. Religious services and special observances are also provi the University community as announced.

MAJOR PROGRAM EVENTS

Art Exhibits—The work of locally, nationally, and internationally artists is shown in monthly exhibits in the Dimock Gallery in Lisner Au um and in the art gallery of the Cloyd Heck Marvin Center. Wi cooperation of the Curator of Art, student art exhibits are presente semester.

Concert Series—The Department of Music presents a series of c featuring faculty, guest, and student artists throughout each year.

Dance—The GWU Dance Company presents major concerts, informal performances, experimental events, television appearances, and lectur onstrations. Students may audition to become company members and h opportunity to choreograph, perform, and gain experience in the te aspects of dance productions.

International Programs—The International Student Society pres annual International Dinner in cooperation with foreign embassies and i tional restaurants. Other programs include regular forums and spea international topics.

Orchestra and Chorus Concert Series—The University Orchestra and are two facets of the lively arts available to students either as credit cou as extracurricular activities. The Chorus presents major performances University community three or four times a year, including regular win spring concerts. The University Orchestra presents several performance ally.

Program Board—The University Program Board, composed chiefly of and appointed students, is given primary responsibility and resour student programming on campus. Through its various committees,

eration with other campus groups, it regularly sponsors films, lectures, erts, social activities, and special events.

eater—The University Theater produces four or five major plays and cals during the year on the proscenium/thrust stage in the Dorothy Betts in Theatre or in Lisner Auditorium. Additional works, including original experimental plays, are produced in a more intimate studio theater. ents have the opportunity to participate in all aspects of theater and may ve credit toward their B.A. or M.F.A. degrees for some of their production .

LETICS, INTRAMURAL SPORTS, AND RECREATION

Charles E. Smith Center for Physical Education and Athletics offers many ities for student use, including courts for basketball, volleyball, and minton; a jogging track; a swimming pool; wrestling, gymnastic, and weight ns; handball and squash courts; and a sauna and lockers. Based in the th Center, the men's and women's athletic departments offer a broad gram of intramural and recreational activities designed to accommodate ous levels of skill, experience, and interest.

he University is a member of the National Collegiate Athletic Association the Atlantic Ten Conference. Its varsity teams compete against major versities throughout the Midwest and Eastern Seaboard in such sports as ketball, baseball, soccer, tennis, golf, wrestling, crew, swimming and diving, ash, badminton, volleyball, and gymnastics.

LUMBIAN COLLEGE OF ARTS AND SCIENCES

n C.M. Lovett
ociate Dean R.C. Rutledge
istant Deans R.E. Knowlton, G. Ludlow, H.B. Wagner
ector of Academic Advising B.P. Selinsky

CULTY 1984–85*

fessors E. Abravanel, J.G. Allee, Jr., J. Aschheim, D.L. Atkins, R.L.A. Bari, R. Barth, W.H. Becker, O. Bergmann, B.L. Berman, L.S. Bielski, L.S. owling, R.G. Brown, J.F. Burks, W.E. Caldwell, E.A. Caress, A.J. Caron Research), R. Caron (*Research*), I.H. Cisin, A.E. Claeyssens, A.G. Coates, T.F. ourtless, Jr., R.H. Davison, L.G. DePauw, R.M. Dunn, Jr., M.A. East, J. isenstein, N. Filipescu, R.S. French, J.A. Frey, R.N. Ganz, Jr., J.L. Gastwirth, .S. Goldfarb, M. Gordon, S.W. Greenhouse, W.B. Griffith, F.S. Grubar, A. yorgy, S.E. Haber, M. Halperin (*Research*), R.C. Haskett, O. Havrylyshyn, .R. Herer, P.H. Highfill, Jr., P.P. Hill, J.W. Hillis, A.J. Hiltebeitel, H.C. linton, H.H. Hobbs, M.A. Holman, C. Hsieh, R.L. Humphrey, Jr., R.G. Jones, .D. Junghenn, I. Katz, J.W. Kendrick, R.E. Kennedy, Jr., R.W. Kenny, H. enyon, Y. Kim, J.C. King, M. King, A.D. Kirsch, P.F. Klarén, R.M. Krulfeld,

e President of the University, the Vice President for Academic Affairs, the Registrar of the versity, the Director of Admissions of the University, and the University Librarian are ex o members of the Faculty of Columbian College of Arts and Sciences.

J.M. Lachin III, C.J. Lange, T.Z. Lavine, H.L. LeBlanc, D.R. Lehman, [illegible] Lengermann, S. Levitan, J.B. Levy, J.F. Lewis, R.K. Lewis, H.W. Lil[illegible] C.A. Linden, R.C. Lindholm, C.W. Linebaugh, T.P.G. Liverman, J.M. [illegible] don, W.F.E. Long, J.C. Lowe, J.H. Maddox, M.L. Meltzer, B.M. Merg[illegible] Miller, C.C. Mondale, J.A. Morgan, Jr., J.N. Mosél, C.A. Moser, P.E[illegible] (*Visiting*), N.N. Natov, H.R. Nau, D. Nelson, B. Nimer, R.K. Packer, R. [illegible] T.P. Perros, E.L. Phillips, F. Prats, D.E. Ramaker, J.P. Reesing, Jr., B. [illegible] W.M. Reynolds, C.E. Rice, J.W. Robb, L.F. Robinson, L.A. Rothblat[illegible] Rowe (*Research*), D.A. Rowley, H.M. Sachar, B.M. Sapin, R.M. Scheffle[illegible] Schiff, R.H. Schlagel, F. Schmidt (*Research*), W.E. Schmidt, L.G. Schw[illegible] R.P. Sharkey, C. Shih, F.R. Siegel, D.E. Silber, N.D. Singpurwalla[illegible] Smythe, H. Solomon, C. Steiner, G. Steiner, R.W. Stephens, C.H. St[illegible] C.T. Stewart, Jr., P.L. Stewart, C. Taam, D.H. Teller, K. Thoenelt, R. Tho[illegible] R.D. Walk, R.H. Walker, Jr., D.D. Wallace, Jr., R.A. Wallace, S.J. Ways[illegible] Wei, D.G. White, J.F. Wright, Jr., H.E. Yeide, Jr., A.J. Zuchelli

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Assistant Professors W.A. Anderson, W.J. Balling, Jr., M.A. Bobrik[illegible] Bositis, M.D. Bradley, W.J. Briscoe, K.M. Brown, C.J. Deering, M.V. Dow[illegible] Feigenbaum, V. Fon, M.A. Foulkes (*Research*), N.C. Garner, F. Griffith[illegible] Gustafson, K.J. Hartswick (*Visiting*), J.E. Hicks, G.P. Huvé, A.M. [illegible] (*Visiting*), L.B. Jacobson, C.C. Joyner, S. Keller, M.P. Lader, J.H. Lebovi[illegible] Lichter, J.P. Link, D.L. Lipscomb, M.B. Loewy, H.M. Mahmoud, A.M[illegible] (*Visiting*), J.H. Miller, M.F. Miller, J.D. Moreno, B. Morgan, S.L. M[illegible] T.K. Nayak, L.A. Nielsen (*Visiting*), L.R. Offermann, P.M. Palme[illegible] Pandian (*Visiting*), T.S. Parry, J.R. Peverley, C.J. Pickar, W.A. Pucil[illegible] S.A. Quitslund, R.M. Robin, A. Romines, B.W. Sabelli, C.E. Scala, [illegible] Schlesselman (*Research*), R.W. Seelke, S.C. Smith, L. Somer (*Visiting*[illegible] Stephanic, M.A. Ticktin, R.P. Tollo, S.A. Tuch, A.W. Urbanas (*Visiti*[illegible] Viterito, H.B. Wagner, W.T. Wander (*Visiting*), G.C.Y. Wang, E.F. Well[illegible] Wigtil (*Visiting*), E.R. Williams, P.W. Wirtz, M.-H. Ye

ittees*

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: T.L. Hufford, J.N. Mosél, J.A. Quitslund, C.S. Moser

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Rutledge (*Chairman*), D.L. Atkins, F.S. Grubar, C.J. Herber, M.A. Holman, Junghenn, D.G. White

ncil of Arts and Sciences†

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dsor P. Booth, *Chief of the News Service, National Geographic Society*
id Edward Finley, formerly *Director, National Gallery of Art*
ert R. Garvey, Jr., *Executive Secretary, Advisory Council on Historic reservation*
ick Hayes, *Managing Director, Washington Performing Arts Society*
Ross Howard, *Office of Public Affairs, Aerospace Industries*

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e Dean of Columbian College is an ex officio member of all committees; all listed nittee members are elected by the Faculty of Columbian College
is Council serves both Columbian College of Arts and Sciences and the Graduate School of and Sciences. The President of the University, the Vice President for Academic Affairs, the of Columbian College of Arts and Sciences, and the Dean of the Graduate School of Arts Sciences are ex officio members of the Council.

John Palmer Reesing, Jr., *Professor of English*
Sidney Dillon Ripley II (*University Trustee*), *Secretary Emeritus, Smith*
Institution
Robert Poindexter Sharkey, *Professor of Economic History*
Julian H. Singman, *Attorney*

INTRODUCTION

Since its founding in 1821, Columbian College of Arts and Sciences, the
arts college of the University, has continued to expand and develop w
city of Washington. Its central situation makes participation in the life
nation's capital convenient for resident students. The cosmopolitan n
the student body reflects the atmosphere of a great world capital. Beca
students come from the 50 states and 120 foreign countries, class disc
and casual student conversations are enriched by a challenging var
viewpoints.

The Columbian College program is a contemporary application of the
liberal arts tradition. Its purpose is to enable the student to develo
particular abilities and general awareness as a human being. It demand
student a thorough acquaintance with one major area of learning
understanding of how that specialization fits into the larger context
scientific, social, and moral problems that confront modern society. It st
broadly enlightened perspective, which encourages its graduates t
through the years in ability and wisdom.

Throughout its history, the College has kept pace with, and ofte
movements of reform in higher education. Sensitive to the rapidly ch
patterns of student and social needs, notably the increasing maturi
knowledge of the modern incoming freshman, the College has from time
inaugurated major changes in its academic programs. In brief summary,
patterns are designed to (1) permit the able student to earn the baccal
degree in less than the standard four years, either by earning credit thr
wide variety of examinations or by performing with excellence within
semester-hour three-year program; (2) provide each student with a
opportunity to design an individual academic program by eliminating
all specific course requirements except in the major field; (3) encour
early and close association between the student and individual faculty
bers in the field of the student's chief interest; and (4) foster a s
community and shared responsibility between faculty and student.

Opportunities exist for double majors (and minors) within the C
interdisciplinary programs; and, in the case of the student who fi
existing major or program suitable to individual educational goals.
interdisciplinary programs that may be developed by the student in co
tion with departmental advisors and with the final approval of the Com
on Curriculum.

Columbian College offers programs leading to the degrees of Assoc
Arts, Bachelor of Arts, Bachelor of Science, and Bachelor of Music; pr
and pre-medical programs; and the first two years of the professional pr
in public and international affairs.

Columbian College has degree-granting authority over certain progra
combine on-campus and off-campus courses, including the Bachelor of S
degree in Cartography. As most of the courses in the first two years o
programs are offered on campus, students may be admitted as full-ti
campus students in Columbian College. After the first 64 hours, mos

es are offered at off-campus locations. Students are then required to
er for their course work with the Division of Continuing Education and
ner Sessions, which administers off-campus programs. Students attending
npus classes are expected to provide their own transportation to and
lass. Distances involved vary from two to 20 miles from the campus area.
ibian College also has degree-granting authority over two other programs
re usually offered off campus and administered by the Division of
nuing Education and Summer Sessions: Associate in Arts in General
es and Bachelor of General Studies (areas of concentration in economics,
y, mathematics, political science, psychology, and sociology). For further
nation on these programs, consult the Division of Continuing Education
Summer Sessions.

RANCE REQUIREMENTS

character and an academic background appropriate for the program of
es contemplated are required.
quirements for admission to the freshman class are as follows:
An acceptable certificate of graduation from an accredited secondary
ol, showing at least 15 units,* which must include four years of English; at
two years of one foreign language; two years of science, preferably with
atory instruction; two years of social studies, one of which must be
rican history; and one year of college-preparatory mathematics beyond
ductory algebra.
The principal's statement that the applicant is prepared to undertake
ge work.
College Board scores submitted on the Scholastic Aptitude Test.
Admission to the Bachelor of Music curriculum requires, in addition to the
e, a performance audition (a tape is acceptable) and/or music testing.

is recommended that the examinations be taken in December or January.
es on tests taken in the junior year may be submitted. Arrangements for
are the responsibility of the applicant and should be made with the
cational Testing Service, 20 Nassau St., Princeton, N.J. 08541; or 1947
ter St., Berkeley, Calif. 94704, not less than one month before the date of the
In applying for the test, the applicant should specify that the scores be sent
he Office of Admissions, George Washington University, Washington, D.C.
52.
he College Board tests are preferred; however, the American College Testing
ery scores will be accepted. The applicant should request that these scores
ent to the Office of Admissions directly from the American College Testing
gram, Iowa City, Iowa. It is recommended that the applicant take the tests in
ober of the senior year.
he Committee on Admission and Advanced Standing will consider the
quacy of the qualifications of an applicant who, because of unusual
umstances, does not present all of the formal requirements stated here. The
mmittee may prescribe appropriate scholastic-aptitude tests of the Universi-
Students admitted with deficiencies in secondary school units will be
uired to begin removing such deficiencies within the first year, by appropri-
courses or examinations.

unit represents a year's study in a secondary school subject, including in the aggregate not
than 120 sixty-minute periods, or the equivalent, of prepared classroom work.

REGULATIONS

See Admissions, Registration, Fees and Financial Regulations, and
tions.

SCHOLARSHIP REQUIREMENTS

Academic Work Load

To encourage academic performance of high quality, the College lim
student's work load.

A full-time student not on probation may take a course load of as muc
semester hours. A student employed more than 20 hours a week who i
probation may take not more than 10 hours.

The amount of work taken by a student on probation may be limited
Committee on Scholarship.

A full-time student who, during the immediately preceding semes
received no grades below *B* and has earned grades of *A* in three courses t
at least 9 semester hours may take 18 or 19 hours. An employed stude
during the immediately preceding semester, has received no grades b
and has earned grades of *A* in two courses totaling at least 6 semester hou
take 12 hours.

A student who accepts employment after registration or at any time d
semester must immediately report that fact to the dean so that the ac
program may be adjusted, if necessary.

Attendance

The student is held responsible for all the work of the course in
registered, and all absences must be excused by the instructor in charge
provision is made for the student to make up work missed.

Adding and Dropping Courses

After registering, a student may add or drop courses only by means of an
"drop–add" form available in the Office of Columbian College. Fai
submit the form when dropping a course may result in a failing grad
deadline for adding a course during the regular fall or spring semester
end of the second week of classes.

The deadline for dropping a course without academic penalty is the
the fourth week of classes in the fall and spring semesters. The deadl
complete withdrawal from all courses without academic penalty is the
the ninth week of classes. After the deadlines, program changes require
student present a petition to the Dean's Council.

Dean's List

The name of any student who takes 15 semester hours or more of graded
work in any one semester, receives grades of *A* in at least 60 percent of
taken in that semester, and has no grades below *B* will be placed on the
List for that semester. A course taken on a Pass No Pass basis beyond
hour minimum of other courses does not affect the student's eligibility
Dean's List, nor are the semester hours of such a course computed in the
figures. A grade of No Pass, however, disqualifies the student from the
List.

emic Standing

dent who is not suspended or on probation is considered to be in good ing.

e following rules governing probation and suspension are applicable as l to students enrolled for a full-time program (12 semester hours or more) g the fall or spring semester. Students enrolled for less than 12 semester during the fall or spring semester and students enrolled during the ner sessions are subject to probation or suspension on the basis of their d for the last four courses (3 or more semester hours each) taken during than one semester, rather than on their record in any one semester.

bation—A student who receives two failing grades (F) in one semester in es carrying 3 or more semester hours of credit each, or the equivalent, is d on probation. A student in the first semester on probation who receives ailing grade in such a course will be continued on probation for a second ster. Two grades of *D* will be treated as equivalent to one grade of *F* in mining probation. Any grades of *D* or *F* replacing earlier grades of *I* will be idered a part of the record for the semester during which the *I* is removed. dent on probation taking 12 or more semester hours whose grades are all *C* tter is removed from probation.

spension—The following cases constitute grounds for suspension: (1) failing grades (F) in courses carrying 3 or more semester hours of credit, or equivalent, in one semester; (2) two failing grades in such courses in the semester on probation; (3) one failing grade in such courses in any later ester on probation. Two grades of *D* will be treated as equivalent to one e of *F* in determining suspension. Any grades of *D* or *F* replacing earlier es of *I* will be considered a part of the record for the semester during which is removed.

he minimum period of academic suspension is one fall or one spring ester. Final dates for applying for readmission are the same as those erning undergraduate admission (see Admissions). A suspended student king readmission must submit evidence to the Committee on Admission Advanced Standing of conduct during absence from the University that cates that the student will profit from readmission. A student suspended ce for poor scholarship will not be readmitted.

lid-semester Warning—When, at the end of the eighth week of each ester, instructors file in the Office of the Dean the names of freshman and homore students who are doing unsatisfactory work, a notice of warning is to the student and a copy filed with the appropriate advisor. A warning stitutes notice to the student to consult the instructor and advisor at the iest opportunity.

mplete/Authorized Withdrawal

ditions under which the grades of *I* (Incomplete) or *W* (Authorized hdrawal) may be assigned are described under Regulations.

emoving an Incomplete—The grade of *I* must be removed no later than the day of the examination period for the fall or spring semester immediately owing the semester or summer session in which the grade of *I* is assigned. Incomplete that is not removed within this period is automatically changed n *F*. In cases of well-documented extenuating circumstances, an instructor a student may jointly petition the dean or the appropriate committee for ditional time in which to complete the work of the course. Such petitions

should be submitted within the same period. The grade of *I* cannot be re
by reregistering for the course here or by taking its equivalent elsewhe

CLASSIFICATION OF STUDENTS

A student becomes a *sophomore* upon completion of 30 semester h
junior upon completion of 60 semester hours, and a *senior* upon compl
90 semester hours.

An *unclassified* student is one who is not a candidate for a bachelor's
(normally because the student already holds one), but who wishes fo
academic reason to take a limited program for a limited time. Registra
this status is permitted only with the prior approval of the appropriate
Council.

Study Abroad Programs in England, France, Peru, and Spain

The George Washington University in England Programs are student ex
programs between GWU and the Universities of East Anglia, Essex, La
and Manchester. They are designed to permit students of the partic
universities to study for an academic year in the exchange university,
remaining enrolled for a degree at their home institution. The Progra
primarily, but not exclusively, intended for liberal arts students who
their junior year and in good academic standing. Participating students
have a minimum grade point average of 3.00.

Students in good academic standing, who will be sophomores or ju
their proposed time of study abroad, may be eligible to participate in the
Washington University–American College in Paris Study in Paris Pr
either for an academic year or for a spring semester. Qualified students
encouraged to take this opportunity to profit from the cultural and intel
riches of Europe by spending a period of time living and studying in P
knowledge of French is desirable but not mandatory, as all courses
foreign languages and literatures are taught in English.

The George Washington University in Peru Program is a student ex
program between GWU and the Universidad Católica del Perú in Lim
designed to permit students of the two participating universities to
variety of subjects for a semester or academic year in the exchange univ
while remaining enrolled for a degree at their home institution. The Pro
primarily, but not exclusively, intended for students specializing in
American studies. The Program is open to all GWU sophomores and
and graduate SPIA students in good standing. Participating students
have a minimum grade point average of 3.00 and have a high proficie
Spanish, since they are enrolled in regular university classes with Pe
students.

The George Washington University Spanish Studies Program in Madri
at the Instituto Internacional en España, is a six-week summer program
by Columbian College of Arts and Sciences and administered by the Divi
Continuing Education and Summer Sessions. Courses are offered in S
language and literature, Spanish civilization, and Spanish art. The pro
open to all students who are in good academic standing. A varying de
Spanish language proficiency is required for all courses, except Be
Spanish and the courses in Spanish art.

Credits earned with acceptable grades will be transferable towa
appropriate degree at George Washington University, provided there
duplication of work previously done. All programs of study abroad m

oved on the required forms by the appropriate faculty and administrative onnel before departure. More information on the programs in England, ce, Peru, and Spain, and on other study-abroad programs, may be obtained Assistant Dean Ludlow at the Office of Columbian College.

ive Status

ents in Columbian College who wish to interrupt their studies may apply e dean for Inactive Status. They may apply at any time before the close of egistration period of the first semester for which this status is desired. If oved, Inactive Status (for which no fee is charged) assures the student that period of one calendar year, re-entrance to the College may take place r regulations prevailing at the time of last registration. After the expiration e calendar year of Inactive Status, *or if the student has attended any other ge or university during absence from this University* (but see below), the ent must follow regular readmission procedures and resume studies, if nitted, under regulations then current.

udents who wish to attend another college or university, in this country or ad, during the period of Inactive Status may, by prior petition to the dean, est approval of the planned program and, if approval is given, be assured of try within one year under regulations prevailing at the time of last tration here.

e of Absence—See Regulations.

ISORY SYSTEM

student is provided with both academic advising and personal counsel- *Academic* advising is performed by members of the faculty selected for knowledge of academic programs, and each student, before registration, es up a program in consultation with the advisor assigned. A student who not selected a major field receives academic advising from a member of the mbian College Committee on Student Advising. A student who has ially declared a major field receives academic advising from the appropri- epartment or from an interdepartmental committee. *Personal* counseling is lable through the Office of the Dean of Students or through the University nseling Center. All students are encouraged to maintain close contact with advisors. Advisors' office hours are posted in the College office.

udents who intend to transfer after the sophomore year to the School of lic and International Affairs are assigned special advisors to assist them in ning their programs.

n academic warning system permits early attention to students whose work below required standards. In such cases, students are asked to consult larly with their advisors. On request, and with the student's permission, es of academic warnings or probation notices may be sent to parents or dians, who are themselves welcome to meet with members of the advisory .

Advising

upplement academic advising by faculty members in Columbian College. advising is also available during fall and spring registration and the mer Advance Registration Program. Undergraduate peer advisors, repre- ing a broad range of major fields, are centrally located to offer scheduling and course selection advice to fellow students. Peer advisors are available

to provide assistance throughout the academic year. A directory o advisors is available from the Peer Advising office shortly after the begin each semester.

DECLARATION OF MAJOR

The student is encouraged to select and officially declare a major field normally no later than the end of the freshman year. All students, ho whether they are entering freshmen or transfer students, must secu advisor's signature on a proper form (obtainable in the Office of Colu College) and return the form to the Office of Columbian College in o declare a major. No student is considered to have a major until this pro completed. Thereafter, the student receives academic guidance from a advisor in the major-field department.

In most cases, filing of the approved declaration form assures the stu admission to the major declared; however, if space, equipment, o requirements compel a department or major program to limit the nu students in that major, admission to the major may be on a selective or available basis.

COLUMBIAN COLLEGE GENERAL COURSE REQUIREMENTS

All candidates for the degree of Bachelor of Arts or Bachelor of Scien admitted to a general arts and sciences curriculum until they declare a field. Except for two general course requirements, all curriculum requir leading to the degrees of Bachelor of Arts and Bachelor of Scien established by the various major-field departments or programs. Bach Music candidates are admitted directly into the departmental curricul

The two general requirements are the following:

1. Each student must, during the freshman year, demonstrate ad achievement in English Composition, either by examination or by taking or 10. The first semester of English Composition may not be postpone second semester (Engl 11, 12, or 13) must be taken no later than the semester of the sophomore year.

2. Each student at some point in the college career must under meaningful initiation into the three divisions of knowledge: huma natural and mathematical sciences, and social sciences. As each majo will normally represent one of these three areas, the requirement fulfilled by taking no less than 12 semester hours in each of the other two The requirement for each division must be fulfilled within two departm in specially designed interdisciplinary programs, such as Humanities. dates for the Bachelor of Music degree are subject to the requirements under Music, under Courses of Instruction.) The 12 credits may be in ap introductory courses or in approved advanced courses if the stud qualified and receives the instructor's permission. Applied and tool cou not satisfy the requirement for meaningful initiation into the humaniti science courses taken in fulfillment of the meaningful initiation requir must include laboratory instruction. Waived courses (no credit ass cannot satisfy the meaningful initiation requirements.

It is recommended that courses taken to satisfy the meaningful ini requirement be selected from the following:

Humanities—American Civilization 71–72, 192; Art 31–32, 71–72; C 71, 72, 100, 108, 113; Chinese 163–64; Communication and Theatre 45,

143, 144, 165, 166, 173; English 51–52, 61–62, 71–72, 191–92; French 51–
0, 91–92; German 51–52, 103–4, 161–62; Humanities 1, 2, 3–4; Music 3–4;
osophy 50 and 71, 111, 112, 113, 131, 132, 151, 152, 162, or 172; Religion
, 59–60, 21–22, or 23 and 9; Slavic 71, 91–92; Spanish 51–52, 91–92.

tural and Mathematical Sciences—Biology 3–4, 11–12; Chemistry 3–4, 11–
Geology 1–2, 5 and 2, or 5 and 105; Mathematics 31–32, 32–33, 41–42, 51–
53–54, 9–10, or any combination of two upper-level math courses; Physics
and 5–6, or 9–10; Statistics 51 and 129 or 105, 53 and 129 or 105, 91 and
or 111–12.

cial Sciences—Anthropology 1–2; Economics 1–2; Geography 1–2; History
72, 39–40, 72 and 91, 40 and 91, one introductory course and a related 100-
l course approved by the History Department, or (for those students who
e waived introductory courses) two sequential 100-level courses approved
he History Department chairman or advisor; Journalism 71–72, 111 and
Political Science 1–2; Psychology 1 and another psychology course;
iology 1–2 or Sociology 1 and any 100-level sociology course; Speech and
ring 11 and any 100-level speech and hearing course.

he following courses will not satisfy the meaningful initiation requirement:
plied courses in art (also Art 1); applied courses in music and in communi-
on and theatre (CmTr 1 and 11); English composition courses; basic (first-
second-year) foreign language courses; Math 3, 6, 30.

uired Placement Examinations

nglish—Students whose scores on either the Test of Standard Written
lish or on the English Composition Achievement Test suggest that they will
efit from more intensive training in compositional skills may be assigned to
l 9 or may be tested in vocabulary, spelling, grammar, standard usage, and
ting skill before placement in either Engl 9 or 10. Students whose scores
icate superior competence will be allowed to waive the Engl 10 require-
nt.

nglish for International Students—see pages 25–26.

oreign Languages—A student who has not been granted advanced standing
l who wishes to continue in college the language begun in high school must
e a placement examination in one of the following: Chinese, French,
rman, Greek, Hebrew, Italian, Latin, Russian, or Spanish. Upon completion
he examination, assignment is made to the appropriate course.

Mathematics—New students who wish to register in Math 30, 31, or 41 are
uired, prior to registration, to take a placement examination in algebra and
gonometry; those wishing to register in Math 51 are required, prior to
istration, to take a placement examination in algebra.

reign Language Requirement

most major programs requiring foreign languages a student must complete
isfactorily the equivalent of two years of college work in a single foreign
guage.

A student offering for admission four acceptable high school units of a single
eign language, or the equivalent, is not required to take any foreign language.
A student who offers less than four units and wishes to continue the same
guage must take the language placement test.

In many instances foreign languages are required or recommend preparation for advanced work. The student should consult the advisor s appropriate foreign languages may be included, when necessary, student's program.

First- and Second-Group Courses

First-group courses, those numbered from 1 to 100, are intended primar freshmen and sophomores. Second-group courses, those numbered from 200, are intended for juniors and seniors. However, a qualified freshm sophomore may, with the permission of the advisor and of the depar concerned, take second-group courses. Such qualification is achiev passing or waiving introductory courses or prerequisite courses in th group.

Courses in the Major Field or Department

Every student is given the opportunity of taking a wide range of liber subjects—humanities, natural and mathematical sciences, social scie both as a means of laying the groundwork for more concentrated majo study and as a means of determining what academic area is best adapted student's interests and aptitudes. In order to enhance this opportunity avoid over-specialization, the student must take at least 60 hours of work outside the major-field department or major program. (This do apply to students in the 90-hour degree program or the Bachelor of program.)

Courses Taken Outside Columbian College

Except for majors in applied mathematics and students in approved t certification programs, no more than 12 semester hours of approved c offered by divisions of the University other than Columbian College may toward bachelor's degrees in Columbian College. Lists of approved cours may be counted toward associate's and bachelor's degrees in Colu College are available in the academic departments and in the Office of the of Columbian College. Students who have extraordinary reasons for exc the 12-hour limit or who wish to take courses not on the approved lis receive prior approval from the Dean.

Naval Science—For information on naval science courses and the Reserve Officers Training Corps, see Naval Science, under Cours Instruction.

Service-Learning Program

A maximum of 15 semester hours in Service-Learning Program courses m credited toward bachelor's degrees in Columbian College.

Earning Credit By Examination

Assuming there is no duplication of course work earned, a maximum semester hours of credit may be assigned for any combination of the follo

College Board Advanced Placement Tests—See Admissions. Credit m granted for college-level courses taken in an approved secondary sch substantiated by satisfactory performance on the Advanced Placement

College Board College-Level Examination Program (CLEP)—See Admis Prior to matriculation, credit may be assigned for CLEP General Examin

ed at the 50th percentile or above. Credit may be assigned for any CLEP ect Examinations passed at the level recommended in the College Board el policy. The General Examination in English composition and a few ect Examinations are unacceptable for credit. After matriculation, credit LEP Subject Examinations will not be assigned without special authoriza- by the Columbian College department governing the subject involved.

pecial Departmental Examinations—A student may request any depart- t of Columbian College to offer a special examination covering the subject er of any specific course. (If an appropriate CLEP Subject Examination is lable, the department may choose to employ it.) Approval of such a request ot automatically granted: the student must offer evidence of sufficient kground to have a reasonable command of the subject matter. A student has previously taken examinations to waive course requirements may not sequently take examinations for credit in the same courses. Assigning credit vaiving a requirement) by special departmental examinations will depend he department's evaluation of the examination paper. These examinations normally be of at least three hours' duration. A fee of $25 for each course nination is charged for preparation, administration, and grading of the nination.

ving Introductory Courses by Examination

acement Tests—Many departments in Columbian College, including En- , mathematics, and all foreign languages, require students to take place- t tests to determine level of proficiency or eligibility for specified courses. student is placed in an appropriate course on the basis of these tests. There o charge to the student for placement tests, and no credit (advanced ding) is awarded for courses bypassed or waived as a result of these tests.

Vaiver Examinations—Several departments in Columbian College, includ- English, history, and sociology, offer periodic waiver examinations for oductory courses. Such examinations may be attempted at the option of the lent; a fee of $5 is charged. Specific departments should be consulted for her details. *Passing a waiver examination does not entitle a student to any ester hours of credit.*

ning Additional Semester Hour of Credit

mally, no deviation is permitted from the number of semester hours of dit given in parentheses after the title of each course. In exceptional umstances, however, and with the prior approval in writing of the instruc- and the dean, a student may register for and earn an additional semester r of credit in certain appropriate second-group (upper-division) courses by ng a significant amount of extra work as assigned and supervised by the ructor.

EPROFESSIONAL REQUIREMENTS

dents who plan to major in any program offered by the School of Public and ernational Affairs are registered during the freshman and sophomore years Columbian College. Requirements for the first two years of these programs, well as requirements for the premedical program, are listed on the following es.

Premedical Curriculum

A premedical student who intends to work toward a bachelor's degree
the general requirements of Columbian College stated above and may
the major-field curricula of any Columbian College department. Each pre
cal program must be approved by the premedical advisor. For admis
most medical schools, the student must have a minimum of 90 semester
applicable toward a degree in an approved college of arts and sciences;
hours must include

1. *Biology*: eight semester hours. This may be either in general biolo
zoology but may *not* include separately credited courses in botany.
2. *Chemistry*: eight semester hours of general inorganic chemistry (
may include qualitative analysis), including four semester hours of labo
and six to eight semester hours of organic chemistry, including laborato
3. *Physics*: eight semester hours, including at least two semester ho
laboratory.
4. *English*: six semester hours. This may be the usual introductory c
course or its equivalent.

Many medical schools have additional entrance requirements, among w
are courses in biochemistry, embryology, histology, genetics, and mathem
Even when such courses are not actually required, they are strongly r
mended.

With the exception of these specific requirements, applicants are ur
follow their personal interests in developing their premedical courses of
A well-balanced program, rather than a specific field, is the criterion by
an applicant is judged. It is not advisable to take courses that appear to
subject matter in the medical program.

Although well-qualified candidates are eligible for admission after co
ing the minimum 90 semester-hour requirement, the majority of applica
found to be better prepared for the study of medicine after four years of c
work.

Preparation for Law School

The best undergraduate preparation for law school is a solid, broad,
education. Columbian College, therefore, does not prescribe a prelegal cu
lum. The Associate Dean of the College, however, is designated as the Pre
Advisor, and students interested in legal studies should consult hi
information and guidance.

Chinese Language and Literature

The first two years in preparation for the Bachelor of Arts degree with a
in Chinese Language and Literature in the School of Public and Internat
Affairs consists of a minimum of 60 semester hours. Each student must, d
the freshman year, demonstrate adequate achievement in English Compos
either by examination or by taking Engl 9 or 10, and Engl 11 or 12. The st
must also undertake a meaningful initiation into the three divisio
knowledge: humanities, natural and mathematical sciences, and soci
ences. As the major field represents one of these three areas, the requir
may be fulfilled by taking no less than 6 semester hours of approved intr
tory courses, or 6 semester hours in approved advanced courses if the stud
qualified and receives the instructor's permission, in the natural and
matical sciences and in social sciences. Students must include in their p

udy Chin 1–2, 3–4, and 9; Chin 7–8 and 9; or Chin 5–6. Chin 5–6 is
erred.

national Affairs, East Asian Studies, or Middle Eastern Studies Curriculum

two years in preparation for the Bachelor of Arts degree in the field of national Affairs, East Asian Studies (China or Japan), or Middle Eastern ies in the School of Public and International Affairs:

		Semester Hours
English:	Engl 9 or 10, and 11 or 12	6
Humanities:	AmCv 71–72; Art 31–32 or 71–72; Clas 108, 113; *Literature (American, Chinese, East Asian, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group philosophy courses; Rel 21, 59–60	6
†Language:	Chinese, Japanese, French, German, Hebrew, Italian, Russian, or Spanish	12–6
Math Science:	BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1, 2, 5, and 6, or 9–10; Stat 51, 53, or 91, and 105 or 129; 129, 130, 111, 112	6–8
ocial Science:	Econ 1–2; Hist 40 and 72; PSc 1, 2, and 91‡	21
§Elective:		3–9
	Total	60

ic Affairs Curriculum

t two years in preparation for the Bachelor of Arts degree in the field of lic Affairs in the School of Public and International Affairs:

English:	Engl 9 or 10, and 11 or 12	6
Humanities:	AmCv 71–72; Art 31–32 or 71–72; Clas 108, 113; *Literature (American, Chinese, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group philosophy courses; Rel 21, 59–60	6
Language or Statistics:	NOTE: This requirement may be satisfied by two years of one foreign language or 12 semester hours of statistics. Statistics courses taken to fulfill this requirement may not also satisfy the math/science requirement below.	12
Math Science.	BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1, 2, 5, and 6, or 9–10; Stat 51, 53, or 91, and 105 or 129; 129, 130; 111, 112	6–8
ocial Science:	Econ 1–2; Hist 40 and 71–72; PSc 1 and 2	21
§Elective:		7–9
	Total	60

a student elects six semester hours of literature in any foreign language, this cannot be used atisfy the language requirement.
hin 5–6 is required for East Asian Studies (China focus) majors; Japn 3–4 is required for East an Studies (Japan focus) majors. Greek and Latin are not acceptable for International Affairs Public Affairs majors. Middle Eastern Studies majors may substitute other languages with approval of the program advisor.
Sc 91 is not required for the Middle Eastern Studies program
redit is not given for courses elected in the Department of Human Kinetics and Leisure dies.

Urban Affairs Curriculum

First two years in preparation for the Bachelor of Arts degree in the fi
Urban Affairs in the School of Public and International Affairs:

English:	Engl 9 or 10, and 11 or 12
Humanities:	AmCv 71–72; Art 31–32 or 71–72; Clas 108, 113, *Literature (American, Chinese, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group philosophy courses; Rel 21, 59–60
Math/Science:	BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1, 2, 5, and 6, or 9–10
Social Science:	Econ 1–2, Hist 71–72, and PSc 2 Three semester hours selected from either AmCv/Hist/PSc 50 or Soc 2
†Elective:	Students may substitute some of the required courses for the major for elective courses during the sophomore year
	Total

DEGREE PROGRAMS

THE ASSOCIATE IN ARTS DEGREE

The Associate in Arts degree may be granted to a student who has comple
semester hours in arts and sciences with acceptable grades and has fulfill
general requirements described on page 74. In addition, the degree m
awarded to students intending to transfer to the School of Public and In
tional Affairs upon completion of the curriculum specified for the fir
years of the appropriate program. The last 15 semester hours of the prog
study must be completed in residence in Columbian College. A st
wishing to receive this degree must file an Application for Graduation
time of registration for the semester or summer session in which the re
ments will be completed.

THE BACHELOR'S DEGREES

Columbian College offers programs leading to the degrees of Bachelor o
Bachelor of Science, and Bachelor of Music.

In cooperation with the School of Medicine and Health Sciences a seve
curriculum leading to the combined degrees of Bachelor of Arts and Doc
Medicine is offered.

For teacher certification for Columbian College students, see the Sch
Education and Human Development.

Requirements for the Degrees

SCHOLARSHIP

One hundred twenty hours of course work must be passed and a grad
(not to be confused with the quality-point index as computed by the Re

* If a student elects six semester hours of literature in any foreign language, this cannot
to satisfy the language requirement.
† Credit is not given for courses elected in the Department of Human Kinetics and
Studies.

shown on the transcript) of 2.00 achieved in courses graded on a 4.00 scale. least 60 hours of course work must be taken outside the major-field artment or major program. (This does not apply to the 129-hour Bachelor of ic curriculum.)

ne grade level is obtained by dividing the number of quality points by the ber of semester hours of courses passed with grades of *A*, *B*, *C*, or *D*. Both number of quality points and the number of semester hours of courses are ed on the student's record at this University. The grade level is computed on ur-point scale—*A*, four points; *B*, three points; *C*, two points; *D*, one point—each semester hour that the student has taken. Courses marked *F*, *Z*, *W*, *I*, *IP*, r *NP* are not considered in determining the grade level, though courses ed with *P* count toward the 120-hour overall requirement. (When a formal le is recorded for an Incomplete, a grade of *D* or better will be included in computation of the grade level.) A grade of Incomplete that is not removed hin one semester is automatically changed to an *F*. Grades earned in courses n at another institution are not considered in computing the grade level. At time of graduation, a student must be in good academic standing. See page or scholarship requirements applicable specifically to departmental majors.

IDENCE

or the *Standard 120-Semester-Hour Program*—A minimum of 30 semester rs, including at least 12 hours in the major field, must be completed in dence in Columbian College. *Unless special permission is granted by the n to pursue work elsewhere, the work of the senior year must be completed* residence. This requirement applies to students transferring within the versity as well as to students transferring from other institutions.

or the *90-Semester-Hour Program*—The last 60 semester hours, including at t 12 hours in the major field, must be completed in residence in Columbian lege.

ummer work may be counted in residence toward all Columbian College rees. For regulations governing students who are absent from the University one semester or more, see Leave of Absence and Inactive Status.

RICULUM REQUIREMENTS

hange in degree candidacy within Columbian College (e.g., from Bachelor of s to Bachelor of Science) requires the permission of the dean. The degree uirements effective at the time the change is approved must be met.

irst-group courses may be required as prerequisities to the major, but ause of their introductory character, they cannot be counted as part of such grams. (See Explanation of Course Numbers, under Courses of Instruction.)

S NO PASS OPTION

nior or senior student in Columbian College who is in good standing may, h the approval of the advisor and the dean, take one course a semester and eive a grade of *P*, Pass, or *NP*, No Pass. No student will be allowed to take re than four pass no pass courses under this regulation. The student may, wever, also receive grades of *P NP* in the proseminar for field-of-study jors and in other courses normally using such grades. A student must sign for the pass no pass option at registration. Under no circumstances may a dent change from pass no pass status to graded status, or vice versa, after the of registration. Courses required in the student's major or minor field

(including those courses required for the major that are offered b
departments) may not be taken on the pass/no pass basis. A transfer
may not choose this option until the second semester of enrollment
University.

TUTORIAL STUDY

A junior or senior of demonstrated capacity, with a special interest
subject matter of a regularly listed course, may be permitted to take
study in residence under the personal direction of the instructor, in acco
with the rules of the appropriate department and with the approval of th
Credit under this plan is limited to the specific semester hours of
designated for each course in the list of courses of instruction. It as
frequent and regular conferences between the student and instructor.

THE STANDARD 120-SEMESTER-HOUR PROGRAM

One hundred twenty semester hours of course work are required for g
tion. At least 60 hours of course work must be taken outside the
department or program. The student should consult the advisor a
registration about choice of courses.

Each student should declare a major as soon as possible, preferably
completion of 30 semester hours. A student may change the major wi
consent of the dean and of the department or committee concerned; the st
must meet the requirements for the new major in effect at the time the cha
approved.

Students transferring from other institutions or from other schools, col
or divisions in this University, with major requirements wholly or substan
met, must satisfy the residence requirement of Columbian College stated a

THE 90-SEMESTER-HOUR PROGRAM

The 90-semester-hour degree program is designed for the exceptionally
student. This program, which leads to the regular Columbian College de
makes it possible to graduate in three normal academic years with a total
semester hours of credit instead of the standard 120. Students in this pro
must complete all of the requirements for the three-year degree in the sem
in which the 90th semester hour is achieved.

The requirements for this program are (1) 90 semester hours of credit e
in college courses (that is, the 90-hour requirement may not be reduce
credit earned through examinations); (2) completion of the chosen major
program and general curricular requirements; (3) grades of *A* in at le
semester hours of course work and no grades below *C*; (4) at least 60 sem
hours of credit earned in 100-level courses; and (5) recommendation o
major department or program.

To be eligible for this program, the student must show evidence of excep
al academic ability by college record, performance in college courses, and
appropriate information.

An interested student should make application directly to the major
departmental chairman or program director as soon as possible, preferab
the end of the first year of study. The student's academic record to that
will, of course, provide a useful criterion of eligibility.

A transfer student may qualify for graduation under the 90-hour progr
he or she completes at least 60 semester hours of the approved 90-hour pro
in Columbian College, earns grades of *A* in no less than 45 semester hou
such course work at this University, and has no grades below *C*.

A student who fails to maintain the required academic performance while studying toward the 90-hour degree program simply continues for the standard 120-hour degree.

Bachelor of Arts

The Bachelor of Arts degree is offered in the following fields:

American Civilization
American Literature
Anthropology
Applied Mathematics
Art History
Biology
Botany
Chemistry
Chinese Language and Literature
Classical Archaeology and Anthropology
Classical Archaeology and Classics
Classical Humanities
Computer and Information Systems
Criminal Justice
Early Modern European Studies
Economics
English Literature
Environmental Studies
Fine Arts
French Language and Literature
General Curriculum in the Liberal Arts
Geography
Geology
Germanic Languages and Literatures
History
Journalism
Judaic Studies
Latin American Studies
Literature in English
Mathematics
Music
Philosophy
Physics
Political Communications
Political Science
Psychology
Radio Television
Religion
Russian Language and Literature
Russian Literature and Culture—in Translation
Sociology
Spanish-American Literature
Spanish Language and Literature
Speech Communication
Speech Language Pathology and Audiology
Statistics
Statistics (Computer Science option)
Theatre
Zoology

Combined Degrees of Bachelor of Arts and Doctor of Medicine

A candidate for the combined degrees of Bachelor of Arts and Doctor of Medicine must (1) complete the entrance requirements for the Doctor of Medicine degree in the School of Medicine and Health Sciences; (2) complete the general Columbian College course requirements; (3) accumulate 90 semester hours in the liberal arts, including a minimum of 30 in second-group courses in Columbian College; (4) obtain the approval of the Dean of Columbian College at the time of entering the School of Medicine and Health Sciences; (5) obtain the recommendation of the Dean for Academic Affairs of the Medical Center at the completion of all prescribed courses in the first year of the School of Medicine and Health Sciences, at which time the degree of Bachelor of Arts will be conferred (professional work taken at another institution will not satisfy any major requirement of the combined degrees); (6) maintain throughout the entire course the scholarship level required for graduation.

Bachelor of Science

The Bachelor of Science degree is offered in the following fields:

Applied Mathematics
Biology
Botany
Chemistry
Computer and Information Systems
Environmental Studies
Geology
Geology (Engineering option)
Mathematics
Physics
Statistics
Statistics (Computer Science option)
Zoology

The Undergraduate Major

There are two types of undergraduate majors: the Field-of-Study major a
Departmental major. Six majors—Classical Archaeology and Anthrop
Classical Archaeology and Classics, Environmental Studies, Judaic St
Latin American Studies, and Political Communications—although interd
mental in nature, are governed by the regulations of the Departmental m

Refer to the department concerned under Courses of Instruction to dete
whether a major is Departmental or Field-of-Study.

FIELD-OF-STUDY MAJOR

Each Field-of-Study major covers a carefully worked out field of coordi
study and is under the supervision of the appropriate department an
Columbian College Committee on Curriculum.

The Field-of-Study major requires no specific program of courses, alth
the student is required to meet the overall general requirements for the de
Ability to pass the Major Examination is assumed to be a convincing de
stration that the student possesses the breadth, depth, and quality of know
of the major usually defined in terms of semester hours, courses, and gr
Information on each field is obtainable from the department. Immediately
declaring a major, students should consult the appropriate department s
they may be assigned an advisor.

The Field-of-Study major places special emphasis on the intellectual d
opment of the individual student. Programs in the same major may
depending upon the individual student's background, previous study
aptitudes. The student is expected to consult the advisor frequently, an
special proseminars offered in some fields give the student further opport
for individual advice and direction in pursuing a program especially adap
individual needs and abilities. A close student–advisor relationship is esse
for the student's success under the Field-of-Study major plan.

Proseminar in the Major—A proseminar is offered in most fields to hel
student acquire a coordinated knowledge of the chosen field through re
study, and laboratory exercises. It is a presentation of the content and me
of the major field as a whole through the organization and coordination
knowledge obtained in the various formal courses in the major subject
material not usually included in such courses. This course is not required
if it is elected, strict attendance is essential. Six semester hours, bu
qualitative grade, may be assigned. When registered in this course, the st
has the privilege of visiting, subject to the approval of the instructor, any
appropriate course offered in the College. (Regular attendance in a co
either for credit or as an auditor, requires registration and payment of tui
Proseminars are open only to the student who has been accepted as a can
under that specific major.

The Major Examination—The Major Examination will normally be ta
the close of the senior year; a student on a limited schedule may take th
earlier than one calendar year before graduation. A student who fails to p

r Examination may, at the discretion of the Committee on Curriculum, be amined at a later regular major-examination period. The Committee on culum has general supervision of the preparation, reading, and grading of r Examinations. Major Examinations are held each semester on dates fixed he department or departments concerned, but in no case later than mber 1 for the fall semester, April 13 for the spring semester, and ist 26 for the summer sessions.

RTMENTAL MAJORS

rtmental majors, unlike Field-of-Study majors, are defined in terms of t hours, required courses, and the attainment of grades no lower than *C* in inimum required second-group courses taken in the major field. A *D* in a ired course will satisfy a curricular requirement in the major, but it will not t toward the minimum number of hours required in the major. (A rtment may require a degree candidate to repeat a required course in h a *D* was received; credit for only one of these courses will be given.) The mum specific requirements for Departmental majors are listed below the of instruction of the department concerned. The chairman of the depart-, or designated departmental advisor, should be consulted at registration erning the student's program of courses; and the entire program, including ives, must be approved by the department. The student is also expected to ult the chairman or advisor in all matters affecting the program of studies, as changes, substitutions, or withdrawals, and especially concerning the ent's progress in a course. A close student–advisor relationship is desir-

RS

ents who wish to familiarize themselves with a field outside their major graduate with a minor in addition to the major. Not all Columbian College rtments offer undergraduate minors; the requirements prescribed by those do are listed under the department involved. A student interested in a r should consult faculty advisors in the department concerned and re both major and minor programs on the appropriate form available in ean's office.

least one-half of the course work required for a minor must be done in ence. Grades of *C* or better must be earned in second-group courses, ding such courses transferred as advanced standing from another institu- Courses passed with a *D* may be used to fulfill a minor field curricular rement but may not be counted toward the total number of credit hours red for the minor.

LE MAJORS

the prior approval of the departments concerned, a student who com- the requirements of two major fields in Columbian College (for example, matics and physics, or English and French, or history and economics) raduate with a double major. Such a student should consult with advisors two departments concerned and officially declare both majors on the priate forms available in the dean's office. A double major must be taken partments offering the same degree (either the B.A. or the B.S.); a major n Columbian College cannot be combined with a major field offered by r degree-granting unit of the University.

INTERDISCIPLINARY PROGRAMS

Regular Interdisciplinary Programs—Programs include American C
tion, Classical Archaeology and Anthropology, Classical Archaeolo
Classics, Early Modern European Studies, Environmental Studies,
Studies, Latin American Studies, and Political Communications.

Special Interdisciplinary Programs—A student who finds no existin
or program suited to individual educational goals may develop a specia
program, in consultation with appropriate departmental advisors. Fi
proval of such a program rests with the Committee on Curriculum
programs with valid and clearly defined academic goals will be approv
each shall be designated by a title suggested by the student to the Comm
Curriculum for approval. At least 45 semester hours of credit of the ap
program must be completed in Columbian College. Because of thei
scope, such interdisciplinary majors may not be combined with a double

A student in an interdisciplinary program will be expected, dur
second semester of the senior year, to take a comprehensive exam
(either oral or written) in the interdisciplinary field, or to undertake a
comprehensive thesis, at the discretion of the student's interdepart
committee.

Special Interdisciplinary Courses—Under the supervision of the Com
on Curriculum, new courses combining the methods and insights of
disciplines will be offered each semester. Interested students should c
the current *Schedule of Classes*, where such courses are numbered in th
A student wishing to use any of these courses to satisfy the mea
initiation requirements should consult the sponsoring department.

General Curriculum in the Liberal Arts—Directed by the Curriculum
mittee of Columbian College of Arts and Sciences, this program is desig
provide a general education in the liberal arts, with or without a major
student chooses. It offers opportunity for achieving a substantial acquai
with each of the three divisions of knowledge through a selection of c
that cultivate a broad perspective in time and in national and/or c
traditions. The committee appointed to advise students in the program c
of one representative each from the humanities, the social sciences, a
natural and mathematical sciences. For curriculum requirements, see G
Curriculum in the Liberal Arts, under Courses of Instruction.

GRADUATE SCHOOL OF ARTS AND SCIENCES

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Associate Dean E.A. Caress
Assistant Deans A.D. Andrews, D.A. Rowley, C.E. Rice

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* The President of the University, the Vice President for Academic Affairs, the Regis
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HISTORY AND ORGANIZATION

The Graduate School of Arts and Sciences is responsible for advance
and research leading to Master's degrees in the arts and sciences and the
of Doctor of Philosophy. Graduate programs at George Washington Un
were first formally organized under the Graduate School in 1905, fo
several decades of gradual growth in a number of departments. In 1
Graduate School was discontinued. Columbian College, the University's
arts college, then assumed responsibility for the Master of Arts and M
Science degrees, and a newly created Graduate Council administered all
of Philosophy programs. Professional schools took responsibility for ad
degrees in the professional fields.

In 1967 the Graduate Council and the Graduate Division of Col
College were consolidated into a new Graduate School of Arts and Sc
All graduate programs in the arts and sciences leading to the degrees of
of Arts, Master of Fine Arts, Master of Forensic Sciences, Master of
Master of Science, Master of Science for Teachers, Master of Sci
Forensic Science, and Doctor of Philosophy are under the Graduate Sc

In addition, a Master of Philosophy degree is awarded by the Schoo
recommendation of the appropriate department, to students who have
fully completed the General Examination for the Doctor of Philosophy

The School is under the direction of the Graduate Faculty of A
Sciences. It is the responsibility of the Faculty to set the requirem
admission to the School, to provide courses and programs of st
research for its students, to establish academic standards for its de
recommend to the Board of Trustees the awarding of degrees, to la
regulations as needed for the operation of the School, and gene
supervise its activities.

The administration of the School is vested in the dean, who is cha
the Dean's Council, which is responsible to the Faculty of the Schoo
policy matters.

ISSION REQUIREMENTS

ication forms for admission to graduate study are obtained from the Office e Dean of the Graduate School of Arts and Sciences. When completed, application forms must be submitted to this office, together with college cripts, letters of reference, and other information as required by the rtment or program. Admission is dependent on departmental recommen- n and approval by the dean.

plicants must have academic backgrounds of excellence, usually with rs, or equivalent, in the fields in which they intend to study for advanced es. Normally, a *B* average (or equivalent) from an accredited college is red. With evidence of special promise, such as high Graduate Record ination scores, an applicant may be accepted whose academic record falls of *B*. The minimum does not assure automatic acceptance. The depart- s may, and often do, set higher admission standards. Moreover, the ber of spaces available for new graduate students limits the number that e accepted. Students who apply in their senior year must have completed baccalaureate work before registration in the Graduate School and must nt evidence of such completion. The Graduate School requires the uate Record Examination (aptitude test only) for all Ph.D. applicants t foreign nationals. Some departments require the aptitude test for cants for the master's degree, and some require a Graduate Record ination advanced test for all applicants. Students whose native language English are required to take the *Test of English as a Foreign Language* FL), administered by the Educational Testing Service, Princeton, N.J. (see 26). International applicants already in Washington may take the Univer- English Placement Test in lieu of the TOEFL.

plication for Admission—Applicants who are requesting fellowship sup- must submit completed applications by February 15 (February 1 for nts in clinical psychology and art therapy) for admission in the fall ter and by November 1 for admission in the spring semester. Completed cations for graduate study without fellowship support must be received y 1 for the fall semester, by December 1 for the spring semester, and by 15 for the summer sessions, unless otherwise noted.

dmission—A student who wishes to resume a graduate program which een interrupted, must file an application form to be considered for ission. Readmission is not guaranteed, and the application is subject to by the department concerned and the dean. The student may be ed to take qualifying examinations on the course work completed. cation forms are available in the Graduate School Office.

LATIONS

dmissions, Registration, Fees, and Financial Regulations, and Regula-

ddition, the Graduate School publishes a Student Handbook each mic year which contains updated information on the School's policies, ions, and other matters of concern to enrolled or admitted students. It is ponsibility of the student to be aware of the information contained in lletin and the Handbook.

Grades

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal, *Z*, Unauthorized drawal; *CR*, Credit.

The grade of *I* indicates that a satisfactory explanation has been given instructor for the student's failure to complete the required work for a The Incomplete must be made up before the lapse of one calendar ye Incomplete for regular course work that is not removed within one c year remains permanently as a grade of *I* on the student's record. The gr cannot be removed by reregistering for the course here or by tak equivalent elsewhere.

The grade of *IP* is given for all thesis and dissertation research course the thesis or dissertation is completed. Upon the satisfactory completio thesis or dissertation, the grade *IP* is changed to *CR* automatically. The g *CR* is given for an *Advanced Reading and Research* course (usually nu 398).

Scholarship Requirements

Graduate students are required to maintain a minimum cumulative average of *B* (3.00) in all course work taken following admission Graduate School. Individual departments may require a higher averag fields of art history and English require a 3.25 average. Only graduate work taken at the University that forms part of the student's program o may be included in the cumulative grade average.

In the case of a student who receives a grade of *F* for a course in the p of studies, the Graduate School will require a written statement fro department justifying the student's continuance in the Graduate Scho outlining the program to be followed. Continuation is contingent up dean's approval. When a grade of *F* is received for a course in the pro studies, the grade is included in the student's grade point average whe not the course is repeated.

A student may repeat a course in which a grade of *C* or above was re only when permitted to do so by the department concerned, unless the description states that the course may be repeated for credit. A statement to this effect must be submitted for approval to the dean's o the appropriate departmental advisor. It is then filed with the Registr course is repeated, the first grade received remains on the student's reco is included in the student's grade point average.

A graduate student may take an advanced undergraduate course (numbered 101–200) for graduate credit only upon the approval of the de the department at the time of registration. Such approval is granted on the provision that the student complete additional work in order to graduate credit.

Program of Studies

The program of studies must be approved by the dean and the depa advisor and filed in the Graduate School Office no later than Novembe graduate students entering in the fall semester or March 15 for g students entering in the spring semester. A program of studies may be when necessary, by obtaining the approval of the departmental advisor dean. The revision must be filed in the Graduate School Office. A co

se cannot be dropped from the program of studies unless its inclusion was o an error in advising or an administrative error. Such a change in the am requires the approval of the dean.

obationary Students—It is especially important for those admitted as ationary students to consult with their departmental advisor as early as ble regarding completion of additional requirements specified in the letter mission. The exact conditions for admission of probationary students be satisfied.

nuous Enrollment

tudents must be continuously enrolled while working toward a degree. ot during the summer sessions. Students who have completed all course , thesis, and dissertation registration requirements and are within their am of studies deadline must register for Continuous Enrollment each ster. There is no charge for this type of registration. If continuous lment is not maintained, the student is dropped from the degree program ss a leave of absence is granted by the Graduate School.

e of Absence

dent who is temporarily unable to continue the program of studies may est leave of absence for a specific period of time, not to exceed one dar year during the total period of degree candidacy. When the period of e has expired, it is the student's responsibility to notify the Graduate ol at least two months in advance of a given registration period of tion to reregister. If a student fails to re-register, the candidacy is inated.

drawal

uate students who intend to withdraw from the Graduate School should m the School in writing. The last day for *complete* withdrawal without emic penalty is at the end of the eighth week of classes.

uation Requirements

tudents must file an Application for Graduation at the time of registration he last semester or summer session of the year in which they intend to uate. Students must be registered in the Graduate School during the ster they plan to graduate. Master's and doctoral candidates may graduate lay, February, or September. Students who have completed the require- ts for a degree but have not yet been awarded the degree will be issued a r to this effect upon request.

REES

d below are the degree programs of the Graduate School of Arts and nces and the specific degrees offered, by field. The programs are directed he departments concerned. Degree programs that bridge two or more rtments are directed by committees composed of members of the depart- ts concerned. For further information write to the dean or the chairman of appropriate department.

udents with special academic goals may pursue individualized programs udy toward the Master of Arts or Master of Science, subject to approval by

the Committee on Individual Programs and the dean. Courses must be
from a minimum of three fields, with a maximum of 18 hours from a
field. A majority of courses must be taken within the Graduate School
and Sciences. Also required is a one-semester colloquium on interdisci
methods. The comprehensive examination is a final essay in whi
integration of the program of study is demonstrated. The School also
Master of Arts and Master of Science degrees in specific academic area
campus locations (see page 96).

Graduate Fields

The graduate course work offered in support of the degree programs
following list is shown by department in this *Bulletin*.

	Degrees
I. Humanities	
American Civilization	M.A.
American Literature	M.A.
Art	M.F.A.
Ceramics	
Design	
Painting	
Photography	
Printmaking	
Sculpture	
Visual Communication	
Art History	M.A.
English Literature	M.A.
*French Literature	M.A.
History of Religions—Hinduism	M.A.
Museum Studies	M.A.
Music	Mus.M.
Applied Music	
Composition	
Conducting	
Music Theory	
Musicology	M.A.
Religion	M.A.
Religion and Medical Care	M.A.
Religious Education	M.A.
Russian Language and Literature	M.A.
*Spanish-American Literature	M.A.
*Spanish Literature	M.A.
Theatre	M.F.A.
Women's Studies	M.A.
II. Social Sciences	
Administrative Sciences	M.A.
Anthropology	M.A.
Criminal Justice	M.A.
Economics	M.A.
Education Policy	
Geography	M.A.

* Any approved combination of French, Spanish, or Spanish-American Literature is
as a Doctor of Philosophy field.

istory	M.A.	Ph.D.
egislative Affairs	M.A.	
olitical Science	M.A.	Ph.D.
ublic Policy		Ph.D.
ublic Policy	M.A.	
Environmental and Resource Policy		
Gerontology		
Philosophy and Social Policy		
Telecommunications Policy		
Women's Studies		
ociology	M.A.	Ph.D.

hysical and Mathematical Sciences

pplied Mathematics	M.A., M.S.	
pplied Statistics	M.S.	
hemical Toxicology	M.S.	
hemistry	M.S.	Ph.D.
ngineering Geology	M.S.	
nvironmental Science	M.S.	
orensic Sciences	M.F.S., M.S.F.S.	
eobiology	M.S.	Ph.D.
eochemistry	M.S.	Ph.D.
eology	M.S.	Ph.D.
lathematical Statistics	M.A.	Ph.D.
lathematics	M.S. for Teachers. M.A.	Ph.D.
hysics	M.A.	Ph.D.

iomedical and Related Sciences

natomy		Ph.D.
rt Therapy	M.A.	
iochemistry	M.S.	Ph.D.
iological Sciences	M.S.	Ph.D.
Biology		
Botany		
Zoology		
linical Microbiology	M.S.	
enetics	M.S.	Ph.D.
licrobiology	M.S.	Ph.D.
athology		Ph.D.
harmacology	M.S.	Ph.D.
hysiology	M.S.	Ph.D.
sychology	M.A.	Ph.D.
adiological Sciences	M.S.	Ph.D.
peech-Language Pathology and Audiology	M.A.	

oined Master of Science and Doctor of Medicine Degrees

nts interested in the combined degrees of Master of Science and Doctor of cine must meet the requirements for admission to the Graduate School of and Sciences and to the Doctor of Medicine degree program of the School edicine and Health Sciences.

e Master of Science program consists of a minimum of 30 semester hours edit and fulfillment of the tool requirement (see pages 91–92). A maximum semester hours of credit for graduate-level courses *completed as a part of* Doctor of Medicine degree curriculum (and not already applied toward the

bachelor's degree) will be allowed in fulfillment of the requirement
Master of Science degree. The remaining 18 semester hours of work, w
most programs includes a thesis, must be work in the basic medical
normally required for a Master of Science degree in the Graduate Schoo
and Sciences.

Joint Master's–Juris Doctor Program

Students interested in working concurrently toward the Juris Doctor d
the National Law Center and a master's degree in the Graduate Schoo
and Sciences must meet the requirements for admission to both school
requirements in each degree program. It is possible for a student to c
work for both degree programs within four years.

Dual Program for Doctor of Medicine and Doctor of Philosophy Degrees

A dual program is available to qualified students who seek both the D
Medicine and Doctor of Philosophy degrees. The requirements that
fulfilled for both degrees are identical to those currently and se
established in the School of Medicine and Health Sciences and the G
School of Arts and Sciences.

A student working toward these degrees may apply a maximu
semester hours of approved course work in the School of Medicine an
Sciences toward the minimum of 48 hours of course work required to
for the General or Cumulative Examination for doctoral candidacy. Thi
work is normally taken during the semesters that alternate with the
program and in the years following the award of the M.D. degree. The s
research for the dissertation may begin concurrently with the final 24 s
hours of graduate course work leading to the General or Cumulative E
tion. The estimated time for the completion of this dual program is s

In order to enter the dual degree program, a prospective student m
apply for and gain admission to both the Graduate School of Arts and S
and the School of Medicine and Health Sciences separately through est
procedures. Upon admission to both schools, the student may then a
affiliation with the dual degree program. Work toward the Doctor of Phi
degree is performed under the jurisdiction of a departmental
committee.

REQUIREMENTS FOR THE DEGREES

The Master's Programs

Unless otherwise specified, the requirements listed below are appli
candidates for the degrees of Master of Arts, Master of Fine Arts, M
Forensic Sciences, Master of Music, Master of Science, Master of Sci
Teachers, and Master of Science in Forensic Science.

1. *General Requirements*—For a master's degree program including
the satisfactory completion of a minimum of 30 semester hours of
graduate work, including 6 semester hours of thesis research, is requir
master's degree program that does not include a thesis, the number of
hours of approved graduate course work is determined by the departm
normally consists of from 30 to 36 semester hours. The program wit
thesis is not an individual student option and is not available
department. Departments can and often do set requirements above t
mum required by the Graduate School.

ork taken to make up deficiencies is never counted as part of the irements leading to a master's degree. Upon approval, up to one-half of the ired graduate work may be taken in courses offered by the other affiliated utions of the Consortium of Universities of the Washington Metropolitan Inc., or by another degree-granting division of this University. If credit is ferred from another institution (see Transfer of Credit, below), the number mester hours which may be taken at an affiliated Consortium institution is ced by the number of hours accepted as transfer credit.

master's degree candidates must complete degree requirements by the dar date specified in the program of studies, which in no case will exceed years. Extensions beyond the specified time period may be granted in otional circumstances, but the student will be required to register and pay credit hours of Reading and Research each semester.

Academic Work Load—Full-time students register for 9 to 12 semester s each semester; part-time students must register for 6 semester hours each ster. Students who work more than 20 hours per week must be part-time nts. These requirements do not apply to students who have fewer than 9 ster hours (full time) or 6 semester hours (part time) remaining to lete their programs. No more than 15 semester hours may be taken during ne semester.

dents who are employed more than 20 hours per week are expected to for part-time academic progams, and they will not be permitted to er for more than 6 credit hours in any semester.

Transfer of Credit—A maximum of one-quarter of the semester hours of ate course work required for a degree may be approved for transfer to the uate School from the Division of Continuing Education and Summer ons, another degree-granting division of this University, or another dited college or university. For a transfer of credit to be approved, *all* of llowing conditions must be met: the course work must have been taken to admission to the Graduate School, it must be approved as part of the nt's program of studies, it must not have been applied to the completion uirements for another degree, it must be post-baccalaureate graduate-level e work, it must have been taken within the past two years, and the student have received a grade of *B* or better in each course for which a transfer of is requested. This action must be requested in writing and approved by epartmental advisor and the dean. A transcript of the course work must be e before the request can be considered.

ool Requirement—Master's degree candidates in the following programs not fulfill a tool requirement: Master of Arts in the fields of administrative es, applied mathematics, art therapy, criminal justice, legislative affairs, matics, public policy, and speech–language pathology and audiology hesis option); Master of Forensic Sciences; Master of Music; Master of ce in the fields of applied mathematics, chemical toxicology, employment , and environmental science; Master of Science for Teachers; and Master e Arts in the field of theatre. All other master's degree candidates lly must successfully complete a tool requirement in a foreign language, matics, statistics, or computer programming, or by graduate course work le the major department (see option [c] below). In place of a tool ement, candidates for the degree of Master of Fine Arts in the fields of ics, design, painting, photography, printmaking, sculpture, or visual unication must complete a methods course selected by the Department

The tool requirement examination should be passed prior to the begin the third semester of graduate work; students who have not fulfill requirement must register for the appropriate course at the beginning third semester. Students who elect graduate course work outside the department in order to fulfill the tool requirement must complete this work before taking the comprehensive examination or undertaking thesis Courses taken to satisfy the tool requirement usually cannot be counted semester-hour requirement for the master's degree. No master's can may attempt a tool examination more than three times. A tool requirem filled at another university cannot be used to fulfill the requirement University.

With the approval of the department directing the student's prog study, the tool requirement may be selected from the following option

(a) Passing a foreign language reading examination (a student may reg the appropriate reading course for nonmajors or make arrangements w appropriate department to take the examination on the scheduled d student majoring in a foreign language may not select that language to this requirement. English may not be elected as a tool requirement.

(b) Completing a course in mathematics, statistics, or computer progr that is approved by the appropriate department and by the Graduate Sc passing a special examination covering the approved course material, a tered by the appropriate department, at the level of the final examinat

(c) Completing with a grade of *B* or better a minimum of six semester h graduate course work in a department other than the student's major ment. Three semester hours of this course work will not be counted tow minimum semester-hour requirement of the student's degree program.

5. *The Thesis*—The main purposes of a master's thesis are to demonst student's ability to make independent use of information and training furnish objective evidence of constructive powers in a chosen fie student registers for six semester hours of thesis research and must co the thesis no later than four calendar years after the initial regis Registration for thesis research entitles the student to the advice and di of the member of the faculty under whom the thesis is to be written. The subject must be approved by the faculty member who will be direct thesis. The thesis—in its final form, with one copy and a certificate of a signed by the thesis director and by at least one departmental reader—s presented to the dean no later than the date announced in the Un Calendar. All theses must meet the form, style, and other requirements s in a pamphlet, *Information Concerning Theses and Dissertations*, avai the Office of the Dean.

6. *Master's Comprehensive Examination*—Most master's degree can must pass a Master's Comprehensive Examination in the major Examinations are held on dates fixed by the departments, so that result filed in the Graduate School Office no later than the day before the meets to approve the list of graduates. The nature and form of the exam is the responsibility of the department or program.

A student who fails to pass the Master's Comprehensive Examination exceptional circumstances, and with the approval of the department dean, repeat the examination at the next scheduled examination date student fails a second time, no further opportunity to take the examin permitted.

Doctor of Philosophy Program

Minimum requirements for the doctoral program are as follows:

General Requirements—The program leading to the degree of Doctor of sophy requires the satisfactory completion of a minimum of 72 semester of approved graduate work for entering students whose highest earned e is a baccalaureate. A minimum of 48 of these hours must be taken in ration for the General Examination. Entering students whose highest d degree is a master's degree are required to register for a minimum of 48 ster hours of approved graduate work, no fewer than 24 of which must be in preparation for the General Examination. While completing the rtation portion of the program, the student must register for 12 to 24 ster hours of dissertation research, depending on the number of hours leted prior to the General Examination. The exact number of semester required for any part of the total program is assigned by each department nay exceed the minimum required by the Graduate School.

ctoral students in the first unit of their programs shall meet the calendar line for completing this unit as specified in the program of studies. pletion of the first unit includes satisfactory completion of course work, requirements, and the General Examination. Doctoral students in the nd unit of their programs, i.e., Dissertation Research, shall have an pved topic on file in the Graduate School Office by the date specified in the ram of studies, which in no case will exceed two years from the comple- date of the General Examination. All remaining doctoral degree require- s shall be completed by the date specified in the program of studies, which o case will exceed five years from the completion date of the General nination. If any of the deadlines specified above are not met, assuming emic approval for an extension, which may be granted in exceptional mstances, the student must register and pay for 6 credit hours of Reading Research each semester. These hours will not be counted toward comple- of the degree.

Academic Work Load—Full-time students register for 9 to 12 semester rs each semester; part-time students must register for 6 semester hours each ester. These requirements do not apply to students who have fewer than mester hours (full time) or 6 semester hours (part time) remaining to plete their programs.

Transfer of Credit—Entering students who do not hold a master's degree request transfer of up to 24 semester hours of credit toward a doctoral ee for acceptable post-baccalaureate graduate work taken at the master's ee level at George Washington University or another accredited college or versity.

Tool Requirements—As early as possible, and before completion of the eral Examination, the tool requirements specified in the program of study t be completed. Various options are available for fulfilling the tool irements; each department may permit certain options and not others, and ndividual choices of tool options must have the approval of the student's artment and of the Graduate School. Options for fulfilling tool requirements as follows:

) Two foreign language reading examinations. English may not be elected as ol requirement.

) High-level proficiency in one foreign language. (See the Graduate School rts and Sciences *Student Handbook* for further information.)

(c) Substitution for one foreign language reading examination of an e
tion in mathematics, statistics, or computer science conducted by the a
ate department. An examination in a graduate course at this Univer
satisfy this requirement.

(d) Substitution of certain graduate course work as follows: a minimu
semester hours, completed with grades of *B* or better, in a departme
than the student's major department, in place of one foreign language
examination. Certain departments may permit options (c) and (d) in
both foreign language reading examinations; certain departments, as w
permit 12 hours of graduate course work in another department to sa
tool requirement.

Students permitted to elect options (a) or (c) above who enter the G
School with a bachelor's degree must satisfy the first tool requiremen
completion of 15 semester hours of course work; students entering
master's degree must satisfy the first tool requirement no later than the
semester of registration as a candidate for the Doctor of Philosophy
Courses taken to fulfill the tool requirement under options (a), (b), and
three of the semester hours' credit earned under option (d) (six if opti
permitted in place of both foreign language reading examinations) wil
counted toward the minimum semester hour requirement for the degr

Further information regarding the various tool requirements may be f
the Graduate School's *Student Handbook*.

5. *The General Examination*—Each student is required to comp
General Examination no later than the semester following the compl
course requirements. The General Examination is composed of a
examination five to six hours in length in each of the areas of study com
the student's total program; the time permitted between each examin
determined by the administering department. Some departments permi
two areas of study to be "written off"; that is, a special, shorter examin
given after a year of course work in the area. A cumulative examination
is in effect in the fields of chemistry and physiology, and in the
psychology a system of two comprehensive examinations is used. Stu
these fields should consult the appropriate department for informatio
its system.

A student who fails to pass any part of the General Examination
exceptional circumstances, and with the approval of the department
dean, repeat the examination at the next scheduled examination dat
student fails a second time, no further opportunity to take the examin
permitted.

Satisfactory performance on the General Examination is required for
sion to the second unit of the Doctor of Philosophy degree program, co
of the dissertation and final examination. Admittance to the second
permitted only if the student's General Examination committee finds
student's performance on the examination and in course work gives
indication of success in the second unit. Passing of comprehensive e
tions at the minimum level does not necessarily give this indication.

6. *The Degree of Master of Philosophy*—Upon departmental recom
tion and approval of the dean, the degree of Master of Philosophy
awarded to students who have successfully completed all requirement
Doctor of Philosophy degree up to and including the General Examina
have been approved for the second unit. Not all departments rec
students for this degree.

The Dissertation and Final Examination—A dissertation is required of doctoral candidate as evidence of ability to perform scholarly research interpret its results. The candidate normally enrolls for Dissertation arch upon completion of the General Examination; however, the candidate register for up to 6 semester hours of Dissertation Research during the time General Examination is being completed. If the dissertation is not com- within five years from the date the General Examination is com- , the student will be required to retake the General Examination. later than the date specified in the University Calendar, the candidate submit to the dean the original and one copy of the dissertation and an act for inclusion in the Announcement of the Final Examination and for duction by University Microfilms, Inc.

hen the dissertation has been approved by the director, two members of the oral Program Committee, and the dean, the candidate takes the Final ination, an oral examination that is open to the public. A committee of iners (composed of Graduate School faculty and, when appropriate, de scholars) conducts the examination. A sufficient number of copies of dissertation must be provided by the candidate for the members of the ination Committee. If the candidate passes, he or she is recommended by Graduate School for the degree of Doctor of Philosophy.

tailed information regarding regulations for the form and reproduction of issertation is available in the Office of the Dean. The successful candidate he doctorate is required, before receiving the degree, to pay a fee that is ed toward the expense of printing the Announcement of the Final ination and the basic service rendered by University Microfilms, Inc.

LOWSHIPS AND FINANCIAL AID

nited number of graduate teaching assistantships and University Fellow- are available in most departments of instruction to students registered in Graduate School of Arts and Sciences. A limited number of other kinds of sored and University awards are also available.

udents applying for admission who also wish to apply for a fellowship ld submit the fellowship application and the application for admission by uary 15; the necessary transcripts, Graduate Record Examination scores, letters of recommendation should also be on file by this date. Students ently enrolled in the Graduate School should submit only the fellowship ication and have current letters of recommendation on file by February 15. rms are available at the Office of the Graduate School of Arts and Sciences. g the fellowship application entitles the student to consideration for all rds available in the student's department.

udents who wish to apply for loans should indicate their intent to do so on pplication for admission. Information concerning loans is contained in a let available from the University's Office of Student Financial Aid.

PERATIVE PROGRAMS

American Studies Program at George Washington University has made erative arrangements with the American Studies Program of the Smithson- nstitution that offer students in the field of American civilization an rtunity to take advantage of the Washington environment. Members of the of the Smithsonian's American Studies Program, National Museum of rican History, National Portrait Gallery, and National Collection of Fine offer seminars and tutorial instruction in fields that provide students with

an unusual opportunity to develop new dimensions in the discip American civilization. This program of study is open to students w toward the degrees of Master of Arts and Doctor of Philosophy and is in to prepare them for research, teaching, and museum-related careers.

The Art Department of George Washington University has made a ments with the Smithsonian Institution to offer graduate programs of stu research in museum studies leading to the degree of Master of Arts in t of art history with a concentration in museum training. The Departm made similar arrangements with the Corcoran Gallery of Art, the Freer G the Hirshhorn Museum and Sculpture Garden, the Museum of African A National Museum of American Art, the Phillips Collection, the R Gallery, and the Textile Museum.

A program of study leading to the degree of Doctor of Philosophy in t of American civilization with emphasis on library research and collect offered by George Washington University by arrangement with the Lib Congress. The coordinator of the Library Program and the staff o orientation seminar and other courses and supervise students in readi research and in work on such library problems as indexing, catalogi bibliography.

For further information concerning these programs, contact one following offices at George Washington University: the Graduate School and Sciences for those who are interested in any of the fields listed abo Art Department for those interested in art museum training, the Am Studies Program for those interested in the field of American civilizati

George Washington University, in cooperation with two other univ and the Folger Shakespeare Library, helped establish the Folger Insti Renaissance and 18th-Century Studies as a cooperative venture in g studies in the humanities. Fifteen universities are now member insti Seminars (limited to 12 students each) are offered each semester un direction of American and foreign scholars. The Folger Library forms t of the Institute. All participants enrolled in the seminars are granted ac the collections of rare books, manuscripts, and reference materials Library. All registered students are eligible to apply for admission to more of the seminars, although priority in enrollment will be ac graduate students working on dissertations and postdoctoral scholars in sponsoring institutions.

Further information, including a listing of seminar topics, is available Office of the Graduate School of Arts and Sciences or at the Folger Shake Library.

The University and the National Bureau of Standards have entered cooperative agreement to further educational opportunity at both the U sity and the Bureau. This arrangement holds promise for graduate stu research, with emphasis in the physical sciences.

OFF-CAMPUS DEGREE PROGRAMS

The Graduate School of Arts and Sciences is currently offering the fo degree programs off campus: (1) the Master of Arts in the fields of Admi tive Sciences, Criminal Justice, Legislative Affairs, and Public Policy concentrations in Environmental and Resource Policy and in Telecomm tions Policy); and (2) the degree of Master of Forensic Sciences. Not all programs may be available in any given year.

OOL OF EDUCATION AND HUMAN DEVELOPMENT

E.W. Kelly, Jr.
ant Dean J.R. Shotel

LTY 1984–85*

ssors J.G. Boswell, L.J. Breen, F.J. Brown, M.A. Burns, R.S. Cottrell, Jr., . Elliott, R. Ferrante, J.D. Fife, E.J. Gleazer, Jr. (*Visiting*), J.A. Greenberg, D. kins, J.C. Heddesheimer, G.L. Horrworth, J.D. Hunt, R.K. Ives, E.W. y, Jr., E.P. Kulawiec, D. Linkowski, D.A. Moore, L. Nadler, S.R. Paratore, . Paup, R.I. Peterson, M.N. Rashid, J.R. Shotel, G.W. Smith, J.E. Snodss, L.M. Stallings, C.E. Vontress, G.D. Wiggs, L. Winkler
iate Professors M.S. Castleberry, D.W. Dew (*Research*), L.H. George, C.H. re, D.H. Holmes, R.N. Ianacone, N.D. Johnson, E.R. Lilly, R.A. Luke, A.J. zur, N.J.S. Sobel, L.A. Tsantis, M.R. Withers
ant Professors P. Finnerty-Fried, M.B. Freund, H. Nashman
ctors B.A. Burns, D.M. Hiltenbrand, T.J. Martin, N.B. Smith (*Research*), Stapp, B.D. Steffen (*Visiting*)

ers of the Advanced Graduate Faculty

oswell, J.L. Breen, F.J. Brown, M. Burns, M.S. Castleberry, R.S. Cottrell, H. Elliott, R. Ferrante, J.D. Fife, P. Finnerty-Fried, M.B. Freund, J.A. berg, D. Hawkins, J.C. Heddesheimer, D.H. Holmes, G. Horrworth, J.D. R.N. Ianacone, R.K. Ives, N.D. Johnson, E.W. Kelly, Jr., E.P. Kulawiec, illy, D. Linkowski, R.A. Luke, A.J. Mazur, D.A. Moore, L. Nadler, S.R. re, D.C. Paup, R.I. Peterson, M.N. Rashid, J.R. Shotel, G.W. Smith, J.E. grass, N.J.S. Sobel, L.M. Stallings, L.A. Tsantis, C.E. Vontress, G.D. Wiggs, nkler

ittees†

TIVE COMMITTEE

reen, R. Ferrante, J.C. Heddesheimer, C.H. Hoare, R.N. Ianacone, L.M. ngs

CULUM COMMITTEE

Castleberry, P. Finnerty-Fried, M.B. Freund, D.H. Holmes, N.D. Johnson, Stallings

TY COMMITTEE

kowski, A.J. Mazur, D.A. Moore, D.C. Paup, G.W. Smith, J.E. Snodgrass

OL, COMMUNITY, AND ALUMNI AFFAIRS COMMITTEE

oswell, D.M. Hiltenbrand, E.P. Kulawiec, H. Nashman

NT COMMITTEE

Luke, A.J. Mazur, G.W. Smith, N.B. Smith, three student members

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President of the University, the Vice President for Academic Affairs, the Registrar of the sity, the Director of Admissions of the University, and the University Librarian are ex members of the Faculty of the School of Education and Human Development
dean and the assistant dean of the School of Education and Human Development are ex members of all committees

INTRODUCTION

The University began offering professional courses for teachers in 190
in 1907 it established a Division of Education. In 1909 the Division
cation became the Teachers College, which in its early years was co
largely with teacher preparation on the undergraduate level.

In 1928 the Teachers College became the School of Education an
provision was made for advanced study. Since that time the Sch
continued to grow; it now comprises a broad range of graduate an
graduate programs. To reflect the current scope of its offerings, th
of the School was changed in 1978 to the School of Education and
Development.

The School of Education and Human Development prepares teachers
service and service industry personnel, resource and support personn
administrators for professional service. The School also offers opportu
experienced professionals to extend and enrich their education. The p
are designed to meet the broad needs of persons who seek knowledge a
necessary to provide effective learning and teaching, research, servic
leadership in a variety of settings. The School's programs address the
persons interested in careers in elementary and secondary schools
include the preparation of individuals for all areas of education and
development, covering the life span from pre-school through the adult
both the public and private sectors of society.

Thus, a degree in Education and Human Development is not
preparation for teaching in schools but also for careers in a variety of pu
private human service and service industry settings. A significant po
the required courses are in the liberal arts. In addition, the programs
opportunities for students to develop critical thinking and reasoning, a
leadership, organizational, and planning skills. Emphasis is place
developing the human relationship qualities that are essential in fie
require involvement with people in all age ranges and from all walks

The School of Education and Human Development is the administra
for three departments: Education, Human Kinetics and Leisure Stud
Special Education. In addition to programs of study leading to its deg
School offers credit and noncredit workshops designed specifically to
unique needs of metropolitan area school systems and other clientele in
industry and government.

Special curricula are tailored on an individual basis for liberal arts
and graduates of other professional schools who are interested in teach
other human services areas. The School also offers a wide range of co
teachers who wish to renew licenses and for provisional teachers who
prepare for teaching certificates.

Laboratory and clinical facilities are provided by the University
Center. Field experiences are provided in cooperation with public an
schools, social and health agencies, museums, institutions in the
community, and community and junior colleges.

The schedule of courses is arranged to meet the convenience of both
and part-time students.

Education for Careers in Teaching

Programs of study for teaching careers are based upon the assump
every teacher should have a broad general education, mastery of the c
instruction, and professional competencies.

relative emphasis placed upon each of these aspects of the total on for teaching varies in accordance with the purposes of each program. ance, since elementary school teachers teach all subjects, they require preparation of greater breadth and less specialization than secondary teachers.

he view of the School of Education and Human Development that an ble minimum education for teaching requires four years of full-time or the equivalent in part-time study. For superior preparation teachers ed to plan for five years of full-time study or the equivalent in part-time

student may choose any one of the following plans to achieve superior ional preparation for teaching or for other education-related fields:

pon receiving the bachelor's degree in education, he or she may take a eaching position and, after acquiring some professional experience, turn to the School for graduate study leading to the master's degree. This lan enables students with bachelor's degrees to begin their teaching areers and to use their work experience to enhance graduate study that vill follow.

he student may choose to pursue full- or part-time graduate study eading to the master's degree immediately after receiving the bachelor's egree.

A student whose bachelor's degree is in one of the liberal arts disciplines nay choose to complete the requirements for certification for teaching by tudying in one of the teaching fields in a program tailored to his or her articular needs.

sional Courses for Non-Education Majors

bian College students in a number of major fields are permitted to use electives to complete up to 18 credit hours of professional education es required for teaching in junior and senior high schools. Students may ate with 120 semester hours or may choose to complete all courses red for teacher certification and graduate with a program in excess of 120 ster hours. Students interested in taking these courses should contact the of the dean of the School of Education and Human Development for ing.

shmen and sophomore students may take professional education courses nclude field work experiences. Some of these courses make it possible for nts who are undecided about their choice of a career to have an rtunity to test teaching and some of the many related human service areas. number of professional education courses are open to non-education rs. It is recommended that students check with one of the three education rtments for more specific information on courses that are open.

ation for Careers in Human Services and Human Development

rams of study for human service and human development careers are ed in the School of Education and Human Development. At the undergrad- level, these include programs in human services, dance therapy and dance performing art, travel and tourism, and exercise and sport. At the master's ee level, programs are offered in the areas of adult education, community nseling, exercise science, human resource development, museum educa- program evaluation, rehabilitation counseling, liaison special educator/ nt educator, therapeutic recreation, and tourism development and travel

administration. Doctoral and specialist programs are offered in adult
human resource development, counseling, and human developmen

At the undergraduate level, programs of study provide a stro
arts general education component, professional studies, and superv
experiences. Graduates are prepared to enter a specialty career field o
with graduate studies. Master's degree programs offer advanced s
studies in a selected field, and doctoral programs provide leade
research skills.

REGULATIONS

See Admissions, Registration, Fees and Financial Regulations, an
tions.

THE BACHELOR'S DEGREES

The School of Education and Human Development offers unde
programs leading to the degrees of Bachelor of Arts in Education an
Development (elementary and secondary education, elementary educa
ly childhood education, special education: complementary teacher
and human services) and Bachelor of Science in Human Kinetics an
Studies (elementary/secondary physical education, dance educatio
therapy, dance as a performing art, exercise and sport, and travel and

Entrance Requirements for Freshmen and Sophomores

Good character and an academic background appropriate for the pro
studies contemplated are required.

Requirements for admission to the freshman and/or sophomore ye
follows:

1. An acceptable certificate of graduation from an accredited s
school, showing at least 15 units,* which must include four years of E
least two years of one foreign language; two years of science, prefer
laboratory instruction; two years of social studies, one of which
American history; and two years of college-preparatory mathematics
2. The principal's statement that the applicant is prepared to
college work.
3. College Board scores submitted on the Scholastic Aptitude Test.

It is recommended that the examinations be taken in December or
the senior year. Scores on tests taken in the junior year may be s
Arrangements for tests are the responsibility of the applicant and
made with the Educational Testing Service, 20 Nassau St., Princ
08541; or 1947 Center St., Berkeley, Calif. 94704, not less than o
before the date of the test. In applying for the test, the applicant shou
that the scores be sent to the Office of Admissions, George W
University, Washington, D.C. 20052.

The College Board tests are preferred; however, the American Colle
battery scores will be accepted. The applicant should request that the
be sent to the Office of Admissions directly from the American Colle
Program, Iowa City, Iowa. It is recommended that the applicant take th
October of the senior year.

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* A unit represents a year's study in a secondary school subject, including in the a
less than 120 sixty-minute periods, or the equivalent, of prepared classroom work

School of Education and Human Development will consider the ade-
of the qualifications of an applicant who, because of unusual circum-
s, does not present all of the formal requirements stated above. The
l may require appropriate scholastic-aptitude tests. Students admitted
leficiencies in secondary school units will be required to begin removing
leficiencies within the first year, by appropriate courses or examinations.
rnational students may be considered for admission with an equivalent
n secondary certificate. A student presenting such a certificate must also
competence in the English language and may be required to enroll in a
me program in English as a Foreign Language before beginning studies in
ee program. Requirements will be determined on the basis of an English
ency Test administered on campus. A candidate who submits a score of
r above on the Test of English as a Foreign Language (TOEFL) may be
ed from taking further course work in English as a Foreign Language but
e required to take the English Placement Examination on campus.
dents who have been out of secondary school for three years or more or do
eet the above requirements may take a special battery of admission tests
ntacting the Office of Admissions or may be considered for admission on
tion to the School of Education and Human Development. A student
ted on probation is required to complete a trial program of 15 semester
of course work with a quality-point index of 2.25 or higher. The selection
rses to be taken in the trial program must be made in conference with a
y advisor.

undergraduates admitted directly to the School of Education and Human
opment are assigned academic advisors at the time of admission. Advi-
rs designated to provide continuity of advising for students throughout
years of undergraduate study. The program for each student must be
ved by a faculty advisor.
e each student's program is defined by individual needs, it is important
udents have a clear concept of their major interest in education and the
services. In the case of teacher education students, they should be
ar with the certification requirements of those localities in which they
to teach. Information on state licensing requirements is available in the
Services Center, located in the Academic Center.

sion with Advanced Standing

ements for admission of students transferring from other regionally
ted colleges and universities and from other divisions of this University
ollows:
ents who have accumulated 15 hours or more of academic credit at
regionally accredited college or university with an acceptable program
ceptable grades may be admitted to the School of Education and Human
opment. Advanced standing may be awarded for properly certified
taken at regionally accredited colleges or universities for which the
received a grade of C or better, and may be applied toward a degree
d that such courses are comparable to the curriculum requirements of
ree at GWU.
ugh a grade of *D* in a course is not acceptable for transfer, the course
used to satisfy a curriculum requirement. Credits earned with a *D* grade
, however, be counted toward advanced standing.
chool reserves the right to refuse credit for transfer in whole or in part
ow credit provisionally.

It is the responsibility of the student to have an official trans
directly from each institution formerly attended to the Office of Ad
George Washington University, Washington, D.C. 20052.

Students may transfer from another division of this University into
program in the School of Education and Human Development. Th
must present an accumulated quality-point index of 2.00 or higher a
of transfer. A student wishing to transfer into the School from another
of this University must submit a formal application of transfer to the
Admissions.

Courses taken at another division of this University may be applied
degree in this School provided they are comparable to the curriculum
ments of the degree.

Nurses filing for admission to the B.A. program in Human Serv
required to submit a copy of their current state nurse's registration (lic
addition to the official transcripts. Nurses may be awarded advanced s
for work completed in a community or junior college program. They m
receive advanced standing of up to 30 credit hours for work comple
two-year teaching hospital program; 45 credit hours may be granted f
completed in a three-year teaching hospital program.

Students applying for transfer from another accredited college or un
or from another division of this University whose previous academic
raise doubts of their ability to complete degree requirements successfu
be admitted to the School of Education and Human Development on pr
To be admitted into the School's degree program, a conditionally a
student must complete a prescribed trial program of 15 semester h
course work with a quality-point index of 2.25 or higher. A student re
in another division of this University who has an accumulated qualit
index of less than 2.00 and is conditionally admitted to this School mus
2.25 quality-point index in the trial program and must, during th
program, bring the accumulated quality-point index to 2.00 or highe
admitted to the School's degree program.

The selection of courses to be taken in the trial program must be m
conference with a faculty advisor in the School of Education and
Development. A conference concerning plans for study as a degree cand
required of each applicant at the beginning and end of the trial progra
successful completion of the trial program, the student who has subm
degree-candidate application will be advanced to degree status.

General Scholarship Requirements for Undergraduates

Regulations regarding academic standing, probation, suspension, with
classification of students, required placement examinations, and
introductory courses by examination are the same as those for Col
College; they appear on pages 67–68 and 71–73 of this *Bulletin*.

ACADEMIC WORK LOAD

Fifteen to 17 semester hours of credit constitute a normal program. A s
with a quality-point index of 3.00 or higher may, with the permissio
dean, enroll for 18 or 19 hours. No student may enroll for more than 19
by permission of the Committee on Scholarship.

The following work load regulations apply to both graduate and unde
ate students.

dents employed 15 hours or less a week may carry a normal program of
ge work.
dents employed from 16 to 25 hours a week may enroll for 12 or 13 hours.
with a quality-point index of 3.00 or higher may, with special permis-
of the dean,* enroll for 15 or 16 hours.
dents employed from 26 to 34 hours a week may enroll for 9 or 10 hours.
with a quality-point index of 3.00 or higher may, with special permis-
of the dean,* enroll for 12 or 13 hours.
dents employed 35 hours or more a week may enroll for 6 or 7 hours.
with a quality-point index of 3.00 or higher may, with special permis-
of the dean,* enroll for 9 or 10 hours.
dents who increase their hours of employment after registration or at any
during a semester must report immediately to the dean so that their
ams may be adjusted if necessary.
duate students employed full time may take a maximum of 6 semester
s, unless special permission to take more is granted by the dean.*

IRED PLACEMENT EXAMINATIONS

glish.—Students whose College Board English Composition Achievement
scores suggest that they will benefit from more intensive training in
positional skills may be assigned to Engl 9 or may be tested in vocabulary,
ing, grammar, standard usage, and writing skill before placement in either
9 or 10.

reign Languages.—A student who has not been granted advanced standing
wishes to continue in college the language begun in high school must take
acement examination in one of the following: Chinese, French, German,
k, Hebrew, Italian, Latin, Russian, or Spanish. Upon completion of the
nination, assignment is made to the appropriate course.

thematics.—New students accepted for registration in Math 30 are re-
ed, prior to registration, to take a placement examination in algebra and
nometry; those wishing to register in Math 51 are required, prior to
tration, to take a placement examination in algebra. (See specific mathe-
cs requirements listed under elementary or secondary education majors.)

ING CREDIT BY EXAMINATION

ergraduate students may earn credit up to a maximum of 30 hours by
rming satisfactorily on College-Level Examination Program (CLEP) tests or
al departmental examinations provided by the departments of Columbian
ge of Arts and Sciences on an individual basis. Passing a waiver examina-
does not entitle the student to any semester hours of credit in the School of
ation and Human Development. A limited amount of credit may be
ned for selected service school instruction received since 1941.
dents interested in becoming certified to teach who have earned bache-
or graduate degrees in fields other than education may satisfy some
ication requirements by taking the CLEP tests or special departmental
inations. See pages 22–23 for general information on the CLEP tests and
formation on special examinations offered by departments.

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est forms are available at the office of the dean. They should be filled out and returned to
ice of the dean at least two weeks prior to registration.

Requirements for the Degrees

To be recommended for a degree, a student must satisfy the ac
residence, scholarship, and curriculum requirements. The amount
work required for bachelor degrees is as follows:

Bachelor of Arts in Education and Human Development—elementar
tion, elementary education/early childhood education, and special ed
complementary teacher program, a minimum of 126 semester hours: s
education and human services, 126 semester hours.

Bachelor of Science in Human Kinetics and Leisure Studies—dance
131 semester hours; elementary/secondary physical education, dance
tion, dance as a performing art, and exercise and sport, 124 semeste
travel and tourism, 120 semester hours.

RESIDENCE

Candidates for the bachelor's degree must complete satisfactorily a m
of 30 semester hours while in the School of Education and Human D
ment.

DEAN'S LIST

To be eligible for the Dean's List a full-time student must obtain a quali
index of 3.5 on courses completed during the past semester. A p
student, to be eligible, must obtain a quality-point index of 3.5 on the
semester hours of course work. Such part-time students must hav
enrolled for at least one three-hour course each semester, and residenc
the period involved must be continuous.

SCHOLARSHIP REQUIREMENTS

For the system of grading and of computing scholarship, see page 45.

In order to graduate, a student must have a quality-point index of
2.25. A quality-point index of at least 2.25 is required before permi
granted to do student teaching in the senior year.

Probation—A student who fails to maintain a quality-point index of
2.25 is placed on probation. The student remains on probation as lon
index is below 2.25 or until probation is removed by the Student Co

Suspension—A student on probation who fails to raise the index
within the time specified may be suspended.

A student suspended for poor scholarship may, within 10 days, ap
case through the dean to the Student Committee. If the case appea
remediable and the student's scholarship seems likely to improve, the C
tee may readmit the student on probation. A student denied readmiss
again, after a lapse of a calendar year, petition the Committee through
for readmission. A student suspended twice will not be readmitted.

USE OF CORRECT ENGLISH

Any student whose written or spoken English in any course is unsati
may be reported by the instructor to the dean. The dean may assign sup
tary work, without academic credit, varying in amount with the need
student. If the work prescribed is equivalent to a course, the regular tu
is charged. The granting of a degree may be delayed for failure to make
deficiency in English to the satisfaction of the dean.

ICULUM REQUIREMENTS

bachelor's curricula at least 30 semester hours must consist of courses ered above 100

NO PASS OPTION

ior or senior student who has a cumulative quality-point index of 2.50 or may, with the approval of an advisor and the dean, take one course a ster and receive a grade of *P* (Pass) or *NP* (No Pass), which will be recorded e student's transcript but will not be reflected in the student's quality- index. No student will be allowed to take more than four pass/no pass es. Students must sign up for such an option at registration. Students may ge from pass no pass status to graded status, or vice versa, after the end of ration only with the permission of the dean and the course instructor. ses required in the student's major field may not be taken on the pass/no basis. A transfer student may not choose this option until the second ster of enrollment at this University.

MPLETE AUTHORIZED WITHDRAWAL

itions under which the grades of *I* (Incomplete) or *W* (Authorized drawal) may be assigned are described under Regulations.

moving an Incomplete. When a grade of *I* is assigned, the instructor d normally set a period within which the uncompleted work (usually the examination or a required paper) must be made up. When required work een completed, it is the responsibility of the instructor to change the grade appropriate. If work is not completed, the instructor will decide whether ange the grade of *I* to *F* or to allow the *I* grade to remain. The grade of *I* ot be removed by reregistering for the course here or by taking its alent elsewhere.

ONAL TEACHER EXAMINATION

National Teacher Examination is optional for teacher education majors. nts should note that some states require the National Teacher Examina- or certification. Students who take the Examination receive individual ts of test scores and may avail themselves of the regular transcript services Educational Testing Service.

lor of Arts in Education and Human Development ing-Field Programs

programs leading to the degree of Bachelor of Arts in Education and n Development (elementary and secondary education, elementary educa- arly childhood education, and special education: complementary teacher am) are planned to provide (1) general educational backgrounds, (2) onal command of concepts and skills in one or more teaching fields, (3) ry of basic professional information and skills adequate for the beginning er, and (4) development of attitudes needed for success in teaching.

CT-AREA SPECIALIZATION

ct-area specialization depends upon the teaching position for which the nt is preparing. Those planning to teach in elementary schools need a e of competency in several fields. Those preparing to teach in junior or high schools must demonstrate competence in a major teaching field. A

minor teaching field is optional, but recommended. The student shou
teaching-field preparation during the first two years.

Teaching-field requirements for secondary education majors, devel
cooperation with appropriate liberal arts departments of the Univer
clude satisfactory completion of prescribed academic courses in one
fields and satisfactory completion of the prescribed special methods
Prescribed academic courses vary in number in accordance with the se
complexity of the teaching field and the licensing requirements of the
states.

Professional Education

The basic professional information, skills, and attitudes needed by be
teachers are provided through a sequence of courses to be taken through
four years of undergraduate study. Lectures and class discussions are
coordinated with field work. Instruction is differentiated to meet the
those preparing to teach on the various levels—elementary, junior hi
senior high school.

The prescribed courses in special methods are concerned primarily
methods of initiating, guiding, and evaluating learning experiences
with the content of teaching fields. They attempt to bring to the student
suggestions drawn from the accumulated experience of successful teac
addition, the courses review the teaching-field content currently in
schools.

Education Curriculum

The following is the curriculum for the first two years in preparation
Bachelor of Arts in Education and Human Development degree with
fields in elementary or secondary education, elementary education early
hood education, and special education: complementary teacher progra

Education/ Special Education:	Educ 50, 71, 72, 104 (for students in elementary a secondary education and the double-major progra SpEd 57, 58, 100, and Educ 102, 104 (for speci education majors)
English:	Engl 9 or 10; 11 or 12; 51–52, 71–72, or 191–92
Mathematics:	Math 9 and 10 (for students in elementary educatio special education, and the double-major program); t semesters chosen from Math 3, 6, 9, or 10 (for second education majors)
Science:	Three semesters (two in biological science and one physical science or vice versa) for students in eleme tary education, special education, and the double-ma program; two semesters for secondary education majors Courses are to be chosen from BiSc 3–4 or 11–12; Che 3–4 or 11–12; Geol 1–2; or Phys 1 and 2, or 9–10
Social Sciences:	Hist 71 or 72 and another social science course (students in elementary education, special educatio and the double-major program); Hist 71–72 or PSc 1 a 2 (for secondary education majors)

	Six semester hours selected from the following: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40; Hist 71–72; PSc 1 and 2; Soc 1 and 2	6
Communication:	CmTr 1 or as approved for secondary education majors; CmTr 11 for students in elementary education, special education, and the double-major program	3
HKLS:	For students in elementary education, special education, and the double-major program	3
Electives:		6–9
	Total	60–63

ofessional Studies Component—Second-semester sophomore students in
her preparation programs (elementary education, secondary education,
entary education early childhood education, and special education: com-
entary teacher program) must file an application for permission to
plete the professional studies component in the junior and senior years.
ications may be obtained in the Office of the Dean or the Office of
ratory Experiences. Academic advisors must recommend students for the
ssional studies component. A writing sample is required.
udents with an education major must be approved for student teaching
to the eighth semester by their academic advisors. A grade-point average
25 on a 4.0 scale is required, as well as a valid medical certificate
ating that the student has taken a T.B. test and is free of tuberculosis.
e teaching-field programs and their requirements are as follows.

entary Education Program

RAL EDUCATION REQUIREMENTS (See Education Curriculum, above.)

CT-AREA SPECIALIZATION

equirements are three semester hours each, to be selected with approval of
dvisor, of art and music survey courses (may be taken on a *P/NP* basis) and
S 122; 9–12 hours of science courses (must include courses in both
ical and biological sciences) and 9 hours of social science courses, to be
ed with approval of the advisor: Econ 1; Geog 1 or 2; Hist 71 or 72; Math 9,
Some of these courses are listed above as requirements under general
ation.)

ESSIONAL COURSES

-two credit hours are required, consisting of Educ 105, 110, 111, 112, 128,
These courses are in addition to Educ 50, 71, 72, and 104 taken during the
wo years.

al Education: Complementary Teacher Program

RAL EDUCATION REQUIREMENTS (See Education Curriculum, above.)

CT-AREA SPECIALIZATION

as the elementary education program above, plus Psyc 101.

ESSIONAL COURSES

equired courses are SpEd 102, 189, 170, 103, 190, 101, 199, 160, and 168;
180.

Elementary Education/Early Childhood Education

Early childhood education can be selected as a concentration by ele education majors. The general education, subject-area specializatio professional courses are the same as those required for elementary ed In addition, students are required to complete Educ 132, 150, 152, 1 154.

Secondary Education Programs

In the secondary education program a number of teaching-field specialt are offered. However, it is strongly recommended that wherever pos candidate undertake the equivalent of a minor in an interdisciplinary area. Early counseling by the program advisor is urged to ensure a balan realistic program of study. The requirements in the secondary ed program are as follows.

GENERAL EDUCATION REQUIREMENTS (See Education Curriculum, above.)

SUBJECT-AREA SPECIALIZATIONS

Art—42 credit hours, including Art 1 and 31–32 or 71–72, and two se third-group art history courses if open to undergraduates; 24 credit hou selected from the following: Art 21–22, 23–24, 41–42, 51–52, 57–58, 81–82, 123–24, 125–26, 127–28, 131–32, 143–44, 151–52, 153–54, 163–64, 166, 179–80, 181, 182, 189–90, 235.

Biology—44 credit hours, including BiSc 11–12; 24 credit hours in upp biological science courses; Chem 11–12 and 50.

Chemistry—40–44 credit hours, including Chem 11–12 and 22 or 15–16 111, 134, 151–52, 153–54, 191; Math 6, 30, 31; Phys 1 and 2.

Communication and Theatre—39 credit hours, including CmTr 1, 11, 49, 101, 103, 112, 121; plus 12 credit hours to be selected from communication (CmTr 126, 127–28, 133, 134, 143, 144), drama (CmTr 1 151–52, 154, 155–56, 165–66), or radio–television (CmTr 75, 133, 134, 1 145, 147, 149), as approved by the advisor.

Earth Science—49–52 credit hours, including BiSc 3–4; Chem 11–12; 2, 111, 125, 151; Math 3 and 6; Phys 1; 9–12 additional credit ho approved by the advisor, to be selected from the following: Anth 186; Ge 128, 141, 163, 189.

English—39 credit hours, including Engl 9 or 10, 11 or 12, 52, 71–72, 1 or 117, 127–28; CmTr 11; and 9 credit hours to be selected from the follo approved by the advisor: Engl 133–34, 135–36, 153–54, 155–56, 161–6 64, 165–66, 167–68, 171–72, 173–74, 177–78.

French—42 credit hours, including Fren 9, 10, 51–52 or 91–92, 103, 1 110, and two full-year second-group French literature courses; 6 s hours from the following: Art 109, 110; Engl 115; a foreign language oth French, as approved; Hist 141–42; Psyc 115.

General Science—43–45 credit hours, including BiSc 3–4; Chem 11–1 16, and 22; Phys 1 and 2 or 9–10; 10 additional credit hours in sci approved by the advisor; 9 credit hours of math to be selected fr following: Math 3, 6, 30, 31, 32, 33.

Geography—24 credit hours, including Geog 1; 3 credit hours selecte Geog 104, 105, 106; 6 credit hours selected from Geog 127, 133, 145, 1

61; 6 credit hours selected from Geog 2, 124, 125, 140, 141, 143; and 6 hours selected from Geog 3, 107, 108, 132, 134, 135, 136, 137, 142.

an—36 credit hours, including Ger 9–10, 51–52, 179–80, and 18 additional hours in German, as approved by the advisor.

y—42 credit hours, including Hist 39–40 and 71–72; 6 credit hours of a y research seminar; 6 credit hours in each of the three following groups, proved by the advisor: Europe; United States; and Russia, Asia, Africa, atin America; 6 additional credit hours, as approved by the advisor, in ne of the preceding groups.

matics—39 credit hours, including Math 30, 31, 32, 33, 121, 123 or 124, hree additional second- or third-group mathematics courses approved by dvisor; Stat 129, 157–58.

—48 credit hours, including Mus 2, 5–6, 103–4, 131, 132, 138, 151; 6 hours of applied music (voice or major instrument); 12 credit hours of ed music (minor instruments other than major, including piano, voice,); ensemble.

cs—36 credit hours, including Math 30, 31, 32, 33; Phys 14, 15, 16, 161, 164, 165, 167.

an—36 credit hours, including Slav 9–10, 91–92, 109–10, 161–62; 12 hours of electives in both language and literature from Slav 101, 103, 10, 125, 141, 151, 152, 165, 166.

l Sciences—42 credit hours, including Econ 1–2; Hist 39–40, 71–72; PSc 2; 6 credit hours to be selected from the following: Anth 1–2; Geog 1, 2; , 2; plus 12 credit hours of second-group courses, as approved by the or, from anthropology, economics, geography and regional science, history, political science, and sociology.

ish—42 credit hours, including Span 9–10, 51–52 or 91–92, 109–10; three ear courses selected from second-group Spanish or Spanish-American ture courses; 6 credit hours to be selected from the following: Anth 115, 172, 185; Art 110, 114, 116, 121–22, 147; Engl 115; a foreign language other Spanish as approved; Geog 115, 161; Hist 161, 162, 163–64, 165, 166; PSc 84; Psyc 115.

ch and Hearing—15 credit hours, including SpHr 11, 101, 103; 6 credit s selected from SpHr 102, 104, 108, 118, 119.

ESSIONAL COURSES

requirements are 21 to 27 credit hours, consisting of Educ 105, 223 (for rgraduate credit), 112, 131, 134 (6–9 credit hours), and 3 credit hours cted from Educ 136, 137, 138, 139, 140, 142, 144, 146. These courses are in tion to the following courses, usually completed during the first two s: Educ 50, 71, 72, 104. Courses in the teaching of reading and computer acy are recommended, since they are required for employment in many dictions.

helor of Arts in Education and Human Development—
an Services Program

Human Services Program is designed for persons who are employed or h to work in the following representative types of human service areas: pitals and health care agencies, residential centers, cultural institutions, g and alcohol abuse rehabilitation programs, correctional institutions, and untary agencies.

The Human Services Program enables students to: (1) develop knowl the diverse human services field and of the functions of direct and i human services roles; (2) develop awareness of, and sensitivity to, multi interacting human values in a pluralistic society; (3) develop human tion and leadership skills; (4) intervene effectively in a helping role; (5) advance in human services occupations; and (6) prepare for graduate stu professional field.

The program includes a variety of courses and field-work exper Opportunities are provided for acquaintance with diverse human settings and professionals in the field and for academic concentra selected departments of George Washington University.

Programs for students are individually planned after an evaluation is previous professional and educational experiences and long-range goa vanced standing may be awarded for liberal arts and specialized completed at accredited colleges and universities.

Students are required to complete the following requirements for the either in previous work at another accredited institution of higher educa at George Washington University. The final 30 semester hours r completed at George Washington University.

Core Courses:	Educ 50, 71, 72, 104, 105, 182; SLP 152; and 15 addition semester hours in the core program selected with advisor approval
Concentrations:	Concentrations are selected in the following fields: admini tration, early childhood education, rehabilitation, specia education, therapeutic recreation, adult education, healt services administration, and human resource development
English:	Engl 9 or 10 and 13
Communication:	CmTr 11, 121
Statistics:	Selected with advisor's approval
Science:	BiSc 3–4
Social Sciences:	Courses selected with advisor's approval: 6 hours of histor or political science; 9 hours each of anthropology an sociology; 6 additional hours including a course in profes sional ethics
Electives:	
	Total

Human Kinetics and Leisure Studies Curriculum

The programs are designed to prepare students for teaching and in Students interested in the Bachelor of Science in Human Kinetics and L Studies with a specialization in elementary/secondary physical educatio complete the following courses during the first two years. (Students s begin to acquire competency in several physical activities in the fir years.)

Education	Educ 71, 72
English:	Engl 9 or 10; 11 or 12; 51–52, 71–72, or 191–92

HKLS:	Four semester hours selected from first-group HKLS courses (59, 60, 61, 62 recommended); HKLS 102, 103, 111–12, 130, 139, 150, 151	28
lath/Science:	BiSc 3–4; Chem 3–4; Geol 1–2; Math 9 and 10; or Phys 1 and 2, or 9–10	6
ial Sciences:	Hist 71–72 or PSc 1 and 2	6
	Six semester hours selected from the following: AmCv 71–72, Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40; Hist 71–72, PSc 1 and 2; Soc 1 and 2	6
	Total	64

two years in preparation for the Bachelor of Science in Human Kinetics Leisure Studies degree with a specialization in dance education:

English:	Engl 9 or 10, 11 or 12, 51–52, 71–72, or 191–92	12
HKLS:	HKLS 108, 150, 151, and 157	12
	Any combination of dance courses numbered 10–58, 121 or 123	12
Education:	Educ 50, 71, 72	9
Math/Science:	BiSc 3–4; Chem 3–4; Geol 1–2; Math 9–10; Phys 1–2, or 9–10	6
cial Sciences:	Hist 71–72 or PSc 1 and 2	6
	Six semester hours selected from the following: AmCv 71–72, Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40; PSc 1 and 2; Soc 1 and 2	6
mmunication:	CmTr 1 or 11	3
	Total	66

st two years in preparation for the Bachelor of Science in Human Kinetics d Leisure Studies degree with a specialization in dance as a performing art:

English:	Engl 9 or 10, 11 or 12, 51–52, 71–72, or 191–92	12
HKLS:	HKLS 108, 114, 150, 157, 175	15
	Any combination of dance courses numbered 10–58, 121 or 123	14
Humanities:	Art, music, or communication and theatre courses, including CmTr 152	12
Math/Science:	BiSc 3–4; Chem 3–4; Geol 1–2, 5; Math 3, 6, 9, 10; Phys 1, 2, 9, or 10	6
ocial Sciences:	AmCv 71–72, Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40, 71–72, PSc 1 and 2; Soc 1 and 2	6
	Total	65

rst two years in preparation for the Bachelor of Science in Human Kinetics d Leisure Studies degree with a specialization in dance therapy:

English:	Engl 9 or 10, 11 or 12, 51–52, 71–72, or 191–92	12
Humanities:	One music, art, or communication and theatre course	3

Science:	BiSc 3–4	6
Social Sciences:	Psyc 5, 8, 101, 110; Soc 1; Anth 2	19
Education:	Educ 71, 72	6
HKLS:	Courses chosen from HKLS 52, 53 or 58 (repeatable for credit), and 108, 150, 157	21
	Total	67

First two years in preparation for the Bachelor of Science in Human Kinetics and Leisure Studies degree with a specialization in exercise and sport:

English:	Engl 9 or 10; 11 or 12	6
Social Sciences:	Four courses selected from AmCv, Anth, Econ, Geog, Hist, PSc, Psyc, Soc	12
Math/Science:	Two courses selected from BiSc 3–4, Chem 3–4, Geol 1–2, Math 9–10, Phys 1–2 or 9	6
HKLS:	HKLS 103, 111, 112, 129, 130, 150, 151, 158, plus four HKLS courses totaling a minimum of 9 credits selected with advisor's approval	33
Electives:		3
	Total	60

Human Kinetics and Leisure Studies Specializations

Prerequisite—For the first two years of the Bachelor of Science in Human Kinetics and Leisure Studies curriculum, see above.

Specialization in Dance Education, junior and senior years—Educ 104, 112; HKLS 109–10, 117, 119, 133, 135–36, 137, 141–42, 144, 150, 151, 175, 200; plus 9 credit hours of electives.

Specialization in Dance as a Performing Art, junior and senior years—20 credit hours selected from HKLS 10–58, 121, or 123; and HKLS 108, 109–10, 120, 135–36, 137, 141–42, 144, 173, 175; plus 9–11 credit hours of electives.

Specialization in Dance Therapy, junior and senior years—10 credit hours selected from HKLS 10–58; HKLS 106, 107, 108, 109, 110, 113 or 114, 117, 119, 120, 136, 137, 141, 142, 144, 150, 157, 173, 175, 184.

Specialization in Elementary/Secondary Physical Education, junior and senior years—60 credit hours are required: CmTr 1 or 11; Educ 102, 103, 104, 105, 112; Engl 52 or 72; HKLS 105, 113, 114, 122, 133, 138, 139, 164, 171; plus 12 hours of an HKLS area of concentration and nine hours of electives.

Specialization in Exercise and Sport, junior and senior years—60 credit hours are required: Engl 51 or 71 and Engl 52 or 72; CmTr 1, 11, or 111; HKLS 100, 113, 114, 138, 139, 140, 159, 164, 171, plus two additional HKLS courses to be selected with advisor's approval; 27 hours of electives selected from Educ 72, 104, 105, 112; T&T 104; BAd 102, 105; Jour 116; Stat 129; or other courses as approved by the advisor.

Travel and Tourism Program

The Travel and Tourism Program is designed for students who are employed in or wish to obtain entry-level positions leading to management roles in hotel and accommodations administration and marketing, airline sales and manage-

ment, travel agency and tour operator staff and management, and other private-sector, travel-related employment. In the public sector, opportunities are available in tourism development departments of states, cities, and countries, as well as associations, including convention and meeting planning and management, tourism planning and development, and marketing of geographical areas such as states and cities.

The Travel and Tourism Program enables students to: (1) gain a holistic understanding of the totality of tourism activities, including the economic, social, cultural, environmental, political, technological, and physical aspects; (2) gain a theoretical and practical framework for analyzing travel and tourism models that utilize existing organizational structures, decision-making systems, and implementation procedures; (3) gain firsthand exposure to practical considerations involved in performing professional tasks; (4) develop techniques for assisting economic growth and the enrichment of the quality of life through travel and tourism; (5) gain a broad education; and (6) prepare for graduate study in a specific field of tourism.

The program includes a variety of courses and field work experiences. Students have the opportunity to individualize their programs to meet specific professional goals. Advanced standing may be awarded for courses completed at accredited colleges and universities.

Students are required to complete the following requirements for the degree, either in previous work at another accredited institution of higher education or at George Washington University. The final 30 semester hours must be completed at George Washington University.

		Semester Hours
Core Courses:	TT 104, 113 or 114, 143, 144, 145, 146, 147, 249, 260, 261, and one course selected with advisor's approval	33
Concentrations:	Concentrations of four courses are selected in the following fields: marketing and sales, business administration, research and quantitative skills, communications management, public policy and administration, and urban, regional, and natural resources management	12
Business Administration:	BAd 51 or Acct 51; BAd 140, and BAd 142 or Psyc 105	9
Communication:	CmTr 1, 2, 111	3
Economics:	Econ 1 and 2	6
English:	Engl 9 or 10; 11 or 12; 101	9
Humanities:	Any two art, literature, language, music, or philosophy courses (a foreign language is strongly recommended)	6
Mathematics:	Any two college-level mathematics courses	6
Social Science:	Any two American civilization, economics, geography, history, political science, psychology, or sociology courses	6
Science:	Any two biology, chemistry, geology, or physics courses	6
Statistics:	Stat 51 or 53, Educ 180 or Stat 129	6
Electives:		18
	Total	120

GRADUATE STUDY

The School of Education and Human Development offers graduate programs leading to the degrees of Master of Arts in Teaching, Master of Arts in Education and Human Development, Education Specialist, and Doctor of Education.

GRADES

For graduate work, grades are indicated as *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Unauthorized Withdrawal; *CR*, Credit. Grades *A*, *B*, *C*, and *F* are counted in computing the quality-point index (see page 46).

Whenever a grade has not been assigned, the symbols *I* (Incomplete) or the *W* (Authorized Withdrawal) will be recorded. The *I* indicates that a satisfactory explanation has been given to the instructor for the student's failure to complete the required work of the course. An instructor recording a grade of *I* will normally stipulate a date by which work must be completed. The instructor has the responsibility for changing the grade of *I* to an appropriate grade upon completion of work or, if work is not completed by the stipulated date, determining whether the grade of *I* should be changed to *F* or allowed to remain in the record.

USE OF CORRECT ENGLISH

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the dean. The dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up such deficiency in English to the satisfaction of the dean.

THE DEGREE OF MASTER OF ARTS IN TEACHING IN THE FIELD OF MUSEUM EDUCATION

The School of Education and Human Development offers an intensive interdisciplinary program in museum education. The program is designed to prepare selected graduates, postgraduates, and professionals for work in art, history, or science museums; zoos, aquaria, or nature centers; and historical societies or sites. Graduates qualify to serve as liaison persons between schools and museums and as professionals in museum-related private and public agencies.

Admission

To be admitted to the program in museum education an applicant must (1) have a bachelor's degree from an accredited institution; (2) submit three written references attesting to quality of academic record and work experience; and (3) be interviewed by the Selection Committee or make alternative arrangements specified by the Committee. Skills in communication, a desire to study and learn from museum collections, and an ability to work with people are essential. Evidence of strong undergraduate, graduate, or professional experience in such fields as American studies, anthropology, art history, fine arts, or the biological or physical sciences is desirable.

Plan of Study

All degree candidates take five sequential core courses in three successive semesters beginning in June and ending in April of the following year. Each

student also pursues four elective courses in a chosen museum-related academic discipline. Two carefully supervised field placements provide direct museum education experience. In the fall semester, students serve two days a week as museum resource consultants to schools or alternative educational sites. In the spring semester, students hold four-day-a-week internships in a museum or museum-related organization. For details, write the Director, Museum Education Program, George Washington University, 2201 G St., N.W., Washington, D.C. 20052.

THE DEGREE OF MASTER OF ARTS IN EDUCATION AND HUMAN DEVELOPMENT

Programs of study leading to the degree of Master of Arts in Education and Human Development are designed to enable prospective teachers and experienced teachers to increase their professional and academic knowledge and skills and to prepare for special types of educational service. They also provide opportunities for college graduates in other disciplines to acquire needed professional education, as well as study in the subjects that are directly related to their professional objectives.

Master's programs are available in the fields listed on the following pages.

Adult Education

The program of study in the field of adult education develops competencies for positions in educational institutions, voluntary organizations, and other institutions in the private or public sectors that sponsor adult learning programs. The students enrolled in this program obtain the skills and understanding required to perform functions associated with the roles of learning specialist, administrator, counselor, and consultant in the field of adult education.

Administration of College Student Development Services

The master's degree program in administration of college student development services provides the academic, professional, and philosophical preparation for entry-level positions in the field of student affairs. The program provides education in administration, counseling, group facilitation, leadership training, and organizational development. Many graduates are employed in colleges and universities in the areas of career development, international student advising, residence hall programming, financial aid, student affairs research, student activities, admissions, and counseling.

Community Counseling

The community counseling program prepares individuals to do vocational, educational, or personal counseling in community or governmental agencies.

Curriculum

The master's degree program in curriculum has been developed to assist educators in meeting state licensing requirements for school administration and supervision. Courses cover a broad range of theory and practice and are appropriate for non–school-based agencies and for educators concerned with program or learning media development.

Dance

The master's degree program in dance is designed to prepare dance specialists for roles in the areas of choreography, therapeutic dance, dance education,

performance, or for specific areas of specialization, e.g., criticism, history, and research. The student plans with the advisor a course of study that considers individual background, professional interests, and career goals. Students from a variety of disciplines are accepted into the degree program.

Early Childhood Education

The master's degree program in early childhood education prepares teachers, directors, and supervisors in nursery schools, day care centers, and kindergartens, as well as researchers and program specialists in the field.

Education and National Development

This program of studies helps develop individual skills and competencies for organizational leadership or leadership support in our rapidly changing society. It provides a core of professional course work, along with competency-based electives, seminars, and internships in federal, state, and local agencies. The program is intended for active and developing leaders in education and related fields in government, institutions, organizations, business, or industry who desire to understand and operate effectively in policy development or policy development support areas.

Elementary Education

The master's degree program in elementary education is planned to help teachers continue their professional growth and advance in competence in their work in regular elementary school classrooms. The program may be used to develop an academic specialization for work with elementary school children or to explore fields of specialization for present or future professional goals.

Elementary/Secondary Administration

The graduate program in educational administration is designed to prepare students for leadership roles in public and private educational organizations. The master's degree program in elementary and secondary administration is considered to provide the minimum entry-level preparation for the positions of principal, assistant principal, and head of department.

Exercise Science

This program is designed to prepare the student to assess physical fitness, prescribe therapeutic activities, conduct exercise programs, and evaluate program effectiveness. Placement opportunities for graduates include occupational health and fitness programs, health spas and clubs, government agencies, and business and industrial programs.

Gifted and Talented

This program is planned to help students to prepare themselves in a comprehensive and research-based manner to teach gifted and talented individuals, to design programs and prepare appropriate instructional strategies and materials for the gifted and talented, and to supervise or administer programs for the gifted and talented. Graduates will be prepared to work with gifted and talented individuals at a self-selected level, ranging from early childhood through adulthood.

Higher Education

The higher education program affords the student a concentration in administration, teaching, or curriculum. Courses prepare students for administrative positions in areas generally encompassing college and university organizations: academic affairs, public relations, finance, and development.

Human Resource Development

The program of study in the field of human resource development is designed for persons either entering or advancing in positions associated with training, education, and development activities in business, industry, government, and other large organizations in the public or private sectors. The program develops competencies needed for responsibilities as learning specialists, administrators, and consultants in this field.

Individualized Master of Arts

This program permits development of individualized programs that integrate existing fields of knowledge, both within the School of Education and Human Development and between Education and other schools and departments of the University and Consortium. The program is designed to meet specific professional objectives of applicants with unique needs. It will be possible to relate independent study, special workshops, international experiences, and a thesis to identified objectives. There must be a balance between foundational and specialty preparation and between theoretical and practical experiences. This program is available within the Departments of Education and Human Kinetics and Leisure Studies.

International Education and Adult Learning

This program is designed for persons either entering or advancing in positions associated with training, education, and development activities in business, industry, government, and other organizations that require international understanding. Program content is based on the learning systems of other peoples and cultures as each reflects values, mores, customs, and current problems, thus helping the student develop a global frame of reference.

Program Evaluation

This interdisciplinary program prepares individuals for careers as program evaluation professionals. Work settings include such fields as education and training, public health, criminal justice, employment, and welfare and human services. Opportunities exist in the federal and state governments, nonprofit institutions, and other public and private agencies conducting evaluations of social and human services programs.

Reading Progress Management: Classroom and Clinic

Teachers who have completed this program have been employed in various school systems, as special reading teachers, reading clinicians, reading consultants, or reading supervisors. Persons who complete the program (or courses selected from it) will be more attractive candidates for regular classroom teaching positions, in addition to being more effective teachers.

Rehabilitation Counseling

This program prepares individuals to provide counseling and psychosocial services to people with physical, emotional, intellectual, or social disabilities.

Employment opportunities exist in state rehabilitation agencies, sheltered workshops, rehabilitation centers, mental health settings, industry, and other settings in the private sector.

School Counseling

The school counseling program prepares individuals to be certified to work as counselors in elementary or secondary schools.

Secondary Education

This program is designed primarily for junior and senior high school teachers who wish to further develop their skills and competencies in teaching. The program is also useful to those interested in learning about secondary schooling in the United States.

Special Education

Early Childhood Special Education

The early childhood special education program consists of 39 hours of graduate credit designed to provide insight and knowledge in the areas of the development of young exceptional children, handicapping conditions of early childhood, identification and assessment procedures in early childhood special education, clinical teaching of developmentally disabled young children, and alternative models of service to the developmentally disabled young child. This two-pronged program prepares teachers of developmentally disabled young children (a direct-service role) and early childhood special education strategists (a consultant role). Admission requirements differ for each role. Eligibility for this program is best determined by a personal interview with the program staff.

Liaison Special Educator/Parent Educator

This is a nonteaching special education program preparing professionals with the expertise to provide leadership and liaison services in the integration of special education, health, and social services for the handicapped child and his or her family.

Psychoeducators of the Seriously Emotionally Disturbed Adolescent

This is a multidisciplinary program blending course work and clinical experiences for preparing special educators who serve the severely disturbed adolescent within the multidisciplinary/interagency team context. With the majority of training provided within the Special Education Department, graduate students are also involved in course work and/or clinical experiences with the Education, Psychiatry and Behavioral Sciences, and Psychology Departments.

Special Educators for Adjudicated Youth

This interdisciplinary program is designed to prepare special educators of adjudicated youth to work in local, state, or federal facilities that serve incarcerated youth (age 18 and under), with emphasis on the special education needs of this population. Graduates of the program will be prepared to provide diagnostic and prescriptive services, educational programming for handicapped youth in juvenile justice facilities, and liaison coordination of facility services with community-based programs.

Vocational/Special Education

This program is designed to provide trained personnel to help the handicapped become self-sufficient in an increasingly complex society. The emphasis of the program has been placed on career training in order to assist the handicapped person obtain a constructive place in the working community. The student receives intensive training in assessment, individual educational planning, pre-vocational education, supportive-vocational education, academic programs, and community placement. A graduate of this program will be prepared to be either a *classroom-based* teacher in a secondary-level school, serving as a work-study coordinator or special education classroom teacher, or a *school-based* resource teacher.

Supervision and Human Relations

The program in supervision and human relations prepares persons for administrative and supervisory positions in public and private schools and school districts. The program is designed to lead toward licensing for administrative and supervisory positions in nearby states. Basic courses relate to general supervisory principles and responsibilities and will also be of interest to educators in nonschool agencies.

Therapeutic Recreation

This program addresses the competencies for professional certification recommended by the National Council for Therapeutic Recreation Certification. The program prepares students for positions in therapeutic recreation in hospitals, institutions, day care centers, geriatric facilities, community recreation departments, and other facilities that provide services to special populations. At least seven roles have been identified in the field of therapeutic recreation: therapist, counselor, educator, supervisor, administrator, researcher, and consultant.

Tourism Development and Travel Administration

The program has an emphasis that is international in scope; it is concerned with public travel and tourism offices, convention and visitor bureaus, research and planning firms, financial institutions, tour wholesalers, travel agencies, educational institutions, and corporations involved in travel and tourism. The program is intended for those concerned with developing competencies needed for entry or advancement in tourism and travel organizations. Graduates are now employed by travel-related businesses, colleges and universities, national tourism agencies, resorts, and in other travel-tourism organizations.

ENTRANCE REQUIREMENTS FOR THE MASTER OF ARTS IN EDUCATION AND HUMAN DEVELOPMENT

A bachelor's degree from a regionally accredited institution of higher education and an acceptable undergraduate academic record are required, along with acceptable scores on the Graduate Record Examination or Miller Analogies Test. In determining eligibility, the School of Education and Human Development considers the last two years of the bachelor's degree and all course work completed beyond the baccalaureate.

Two years of successful teaching are required before admission to candidacy in the field of elementary/secondary administration.

Appropriate prerequisities may be required by each master's degree major field program.

An interview in the office of the dean is required for applicants who live in the Washington, D.C., metropolitan area; a letter of reference is required of all other applicants.

ADVANCED STANDING

Advanced standing is granted for approved courses taken at other accredited insitutions, but a minimum of 24 semester hours must be completed at this University as a master's candidate.

A maximum of 12 semester hours of advanced courses completed in this University in excess of the requirements for the bachelor's degree may be credited toward the master's degree if the work fits in with the student's plan of specialization.

Advanced standing is not granted for work completed five or more years before application for admission or readmission to master's candidacy.

PLAN OF STUDY

The plan of study leading to the degree of Master of Arts in Education and Human Development requires a minimum of 33 hours of graduate credit. The plan may, at the student's option, include a thesis carrying six hours of graduate credit. Whether or not a student selects the thesis option, a minimum of 18 hours must be from courses planned primarily for graduate students (third-group courses). A minimum of 12 hours, not including the thesis, must be from courses offered by the School of Education and Human Development.

Programs are planned initially in conference with an admission advisor in the School of Education and Human Development and subsequently with a designated advisor in the candidate's area of specialization. Programs are based on a candidate's interests and background; those related to teaching in public schools are designed around certification requirements of the state and locality in which the candidate plans to teach.

All degree requirements must be completed within six years.

RESIDENCE

A candidate for the master's degree is required to complete satisfactorily 24 semester hours in residence.

SCHOLARSHIP

A quality-point index of 3.00 is required for graduation. Students who receive the grade of *C* in more than six semester hours are subject to suspension. Students who receive a grade of *F* must confer with the dean before enrollment for further work.

THE THESIS

The choice of the thesis subject must be approved in writing by the student's advisor and filed in the office of the dean. A statement of the School of Education and Human Development standards for the thesis and printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the office of the dean.

Payment of tuition for the thesis course entitles the candidate, during the period of registration, to the advice and direction of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished, additional time may be granted. The student must, however, be enrolled continuously in the program. If the preparation of the thesis extends beyond the additional time

granted, the student must register for the entire six hours of thesis again and pay tuition as for a repeated course.

MASTER'S COMPREHENSIVE EXAMINATION

Candidates in master's programs requiring 33 semester hours may, with the approval of the academic advisor, elect to take an additional three-semester-hour course in lieu of a comprehensive examination. Candidates in programs whose basic requirements exceed 36 semester hours may waive the comprehensive examination with approval of the academic advisor. Candidates who plan to take the examination must be registered in the semester it is to be taken and must file a written application in the office of the School of Education and Human Development no later than 30 days prior to the date of the examination. Comprehensive examinations are required of students in Early Childhood Education, the Administration of College Student Development Services, Gifted and Talented, Reading Progress Management: Classroom and Clinic, all programs in Human Kinetics and Leisure Studies, and all programs in Special Education.

WORK IN OTHER ACADEMIC DEPARTMENTS

For teachers interested in developing or strengthening their academic competence, the master's programs in elementary and secondary education normally permit 15 to 18 semester hours of work in departments other than education. These programs are designed to meet the need of in-service teachers who need additional work in content to qualify for advanced certification or to improve their classroom skills and may also be helpful to previously trained teachers planning to re-enter the profession. The major emphasis is upon strengthening both academic and professional competencies.

SECOND MASTER'S DEGREE

Persons seeking a second master's degree in the School of Education and Human Development must complete all core and specialization requirements and a minimum residency requirement of 24 semester hours.

THE DEGREE OF EDUCATION SPECIALIST

The program of advanced study leading to the degree of Education Specialist is for students with master's degrees in education who seek further professional preparation for specific objectives.

Education Specialist programs are available in the fields of administration, adult education, counseling, curriculum, higher education, human resource development, and special education.

Entrance Requirements

The degree of Master of Arts in Education and Human Development or equivalent, two years of pertinent experience in education, and a graduate scholastic average of at least 3.3 or a 50th percentile score on the Graduate Record Examination or Miller Analogies Test are required. A score on one of the specified tests must be submitted as part of the admission procedures.

Each applicant must be interviewed and recommended by a faculty advisor in the major field, who will submit a tentative program plan prior to admission.

Scholarship

Scholarship requirements for the degree of Education Specialist are the same as those for the degree of Master of Arts in Education and Human Development (see above).

Programs of Study and Degree Requirements

Individual programs are developed, through the faculty-advisor plan, to fit the candidate's skills, interests, and career goals. A minimum of 30 semester hours beyond the requirements of the degree of Master of Arts in Education and Human Development is required. At least 21 hours of this work must be taken on campus at this University; with the approval of the advisor, the remaining semester hours of the program may be taken in off-campus offerings of the GWU Division of Continuing Education and Summer Sessions or at another approved university. A maximum of five calendar years is allowed for completion of the program.

At least 12 of the required 30 hours must be in appropriate graduate courses in education selected from the following areas: (1) foundations and cognate study, (2) background and general principles of the field of study, and (3) an area of specialization.

The Comprehensive Examination

Successful completion of a six-hour written examination and/or an oral examination, at the option of the major field advisor, is required.

THE DEGREE OF DOCTOR OF EDUCATION

The School of Education and Human Development offers programs of advanced study leading to the degree of Doctor of Education. These programs, which are under the supervision of the Advanced Graduate Faculty, provide major fields of study in teacher education, special education, counseling, leadership and policy management, adult education, human development, human resource development, and higher education. Supporting fields are available in administration, administration of higher education, adult education, college student development, counseling, curriculum, elementary education, higher education, human development, human resource development, international education, program evaluation, reading, secondary education, special education, supervision, teacher education, and tourism development and travel administration. With the approval of the Advanced Graduate Faculty and the departments concerned, one supporting field may be taken in other departments of the University. All programs require study of interrelated areas of education and a doctoral dissertation in the major field of study.

Admission

The applicant must have adequate preparation for advanced study, including graduate work in fields prerequisite to his or her objective, equivalent to that required for the degree of Master of Arts in Education and Human Development at this University, at least three years of successful pertinent educational experience and a capacity for creative scholarship and effective leadership.

The applicant first arranges for an interview with the assistant dean to explore the applicant's needs in relation to the resources of the School and to guide the student in applying for doctoral study; the required procedures and standards will be explained at this time. Three additional personal interviews

are required. Candidates meeting the initial standards are admitted to precandidacy for the degree.

PRECANDIDACY

In the precandidacy period a minimum of nine semester hours of course work in the program, including requirements specified by the Advanced Graduate Faculty, must be completed. This work must be completed within three semesters of admission to precandidacy, for part-time students, or within the first 18 semester hours of course work, for full-time students. Application for full candidacy will then be decided on the basis of the quality of scholarship in the precandidacy period, the recommendations of instructors, a detailed plan for the balance of the program, and a qualifying examination.

Plan of Study

In general, from two to three years of full-time study beyond the degree of Master of Arts in Education and Human Development, or the equivalent in part-time study, are required. Programs are individually planned. It is estimated that, for the average student, the work required for the total program will be 75 semester hours, including a minimum of 12 semester hours of Dissertation Research.

Each program is divided into two parts. The first consists of preparation for comprehensive examinations and completion of a required research tool field. The second is composed of research investigation, the writing of a dissertation, and the final oral examination.

Students who have completed the comprehensive examinations must register for a minimum of six semester hours of Dissertation Research (Educ 491) per semester until 12 hours have been completed and a minimum of 3 semester hours per semester thereafter, to a total of 24 semester hours, until the satisfactory completion of the final examination.

COMPREHENSIVE EXAMINATIONS

Upon admission to doctoral candidacy the student is assigned to a committee, each member of which is responsible for guiding the preparation for one of the required comprehensive examinations in supporting fields or the major field comprehensive examination. The candidate must arrange individual conferences with the committee members to determine the content of each field and to receive guidance in preparation for the examination.

The supporting field examinations, when required, are taken first: these are three-hour written examinations. In addition to the research tool field, a student who plans a historical research investigation for the dissertation may be required to complete an appropriate research seminar offered by the Department of History. The tool requirement must be completed prior to the major field examination. The major field examination is a written 12-hour examination, six hours on each of two successive days.

The candidate begins the second part of the program after the satisfactory completion of all supporting field examinations, the required research tool field, and the major field examination.

THE DISSERTATION

A dissertation is required as evidence of ability to perform scholarly research and to interpret and present its results.

During the first part of the program, the dean appoints a dissertation committee, consisting of a chairperson (usually a major field advisor) and two additional faculty members. The candidate is required to submit a proposal for the dissertation to this committee, which determines its acceptability. The dissertation is completed under the guidance of the chairperson, with the advice of the other members of the dissertation committee.

No later than the date specified in the calendar, the candidate must submit to the dean five complete copies of the dissertation and two copies of an abstract for inclusion in the announcement of the examination and for reproduction by University Microfilms, Inc. Printed copies of detailed regulations regarding the form and reproduction of the dissertation, preparation of the abstract, and services offered by University Microfilms, Inc., are available in the office of the dean. The successful candidate for the doctorate is required, before receiving the degree, to pay a fee that is applied toward the expense of printing the Announcement of the Final Examination and the basic service rendered by University Microfilms, Inc., and to sign a microfilm agreement.

THE FINAL EXAMINATION

When the dissertation has approval of the director, the candidate is recommended to the dean for the final oral examination, which must be passed at least three weeks before the degree is to be conferred. The examination is open to the public and is conducted by a committee of the faculty, appointed by the dean, supplemented by at least two leaders in the candidate's field of study from outside the University. Candidates who successfully pass the oral examination are recommended for the degree by the faculty of the School of Education and Human Development.

Residence and Continuous Study

All preparation for the degree, including examinations, courses, seminars, and other work done under the direction of an advisor, must be done in residence. The student must be continuously enrolled in the School of Education and Human Development, unless the dean or the Advanced Graduate Faculty grants a leave of absence. Failure to register each semester of the academic year may result in lapse of candidacy. Subsequent readmission is subject to whatever new conditions and regulations have been established by the Advanced Graduate Faculty.

The supporting and major field examinations must be completed within five years of the date of admission, and the entire program must be completed within eight years, regardless of full-time or part-time study. All candidates must satisfy one of three options for full-time study. Information concerning these plans will be provided by the assistant dean upon request by the candidate.

SPECIAL PROGRAMS AND SERVICES

Graduate, Undergraduate, and Nondegree Training of Personnel Serving the Handicapped

The School of Education and Human Development offers various programs for the education of personnel serving the handicapped. Field-based training experiences are arranged throughout the metropolitan area. Students are accepted at the undergraduate, master's, and doctoral levels. Regular education and special education teachers and school administrators, as well as students

from other schools and colleges at the University, may elect these courses. Inquiries concerning the programs and the availability of federal awards should be directed to Dr. Michael Castleberry, Department of Special Education, George Washington University, Washington, D.C. 20052.

Graduate Program in Rehabilitation Counseling

This master's degree program prepares rehabilitation counselors to assist persons with disabilities or disadvantages to assume a place in society. The 51-credit-hour program combines field work and course work in preparing students for employment in an expanding field that yields high humanitarian rewards. Both the profession and the program are interdisciplinary, drawing upon such related areas as medicine, psychology, social work, sociology, and special education. A limited number of traineeships are available.

Inquiries concerning the program, the availability of traineeships for full-time students and applications should be directed to Dr. Donald Linkowski, Rehabilitation Counselor Education, George Washington University, Washington, D.C. 20052.

Graduate Specialization in Therapeutic Recreation and Adaptive Physical Education

This master's degree program in the field of physical education, with a specialization in therapeutic recreation or adaptive physical education, is funded by the Bureau of Education for the Handicapped, U.S. Department of Education. Inquiries concerning the program and the availability of graduate research assistantships and internships should be directed to the Chairman, Department of Human Kinetics and Leisure Studies, George Washington University, Washington, D.C. 20052.

Therapeutic Recreation Technician Certificate Program

The Department of Human Kinetics and Leisure Studies offers a certificate program in therapeutic recreation. This prototype technician program trains paraprofessional personnel to work in a variety of settings, such as community recreation centers, state institutions, correctional facilities, and nursing homes. The curriculum emphasizes the therapeutic recreation process and activity leadership skills. Students who complete the program will qualify for professional registration with the National Therapeutic Recreation Society. Students in the Human Services Program with a concentration in therapeutic recreation may participate in this program. Inquiries should be addressed to Chairman, Department of Human Kinetics and Leisure Studies, George Washington University, Washington, D.C. 20052.

Certification Curricula

The School of Education and Human Development provides individually planned programs for liberal arts graduates with appropriate degrees from accredited institutions who wish to prepare for teaching. Those seeking certification, but not wishing to work for a degree, may enroll in a certification program if they meet the admission, scholarship, and personality requirements of degree candidates. The School also provides a wide range of courses of interest to teachers who wish to renew licenses.

Reading Center (See page 52)

Off-Campus Degree Programs

The School of Education and Human Development offers off-campus programs leading to the Bachelor of Arts in Education and Human Development in the fields of human services and special education: complementary teacher program; the Master of Arts in Education and Human Development in the fields of adult education, elementary education, higher education, human resource development, reading progress management: classroom and clinic, secondary education (analysis of classroom teaching), special education/early childhood, vocational special education, and supervision and human relations; and the Education Specialist in the field of administration and higher education. The programs are coordinated through the Division of Continuing Education and Summer Sessions.

SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION

Dean N.M. Loeser
Associate Dean B. Burdetsky
Assistant Deans J. Lobuts, Jr., C.W. Washington

FACULTY 1984–85*

Professors F. Amling, H.G. Askari, W.H. Becker, P.S. Birnbaum, G. Black, D.S. Brown, B. Burdetsky, S.R. Chitwood, K.J. Darr, M.C. Devolites, S.F. Divita, R.F. Dyer, R.B. Eastin, A. El-Ansary, R.W. Eldridge, R.F. Ericson, E.H. Forman, S.S. Fuller, M.G. Gallagher, F. Ghadar, S. Greene, P.D. Grub, W.A. Hahn (*Visiting*), W.E. Halal, W.C. Handorf, M.M. Harmon, J. Hilmy, J. Harvey, F.C. Kurtz, G.P. Lauter, G.L. Lippitt, N.M. Loeser, A.J. Mastro, D.C. McGrath, Jr., J.E. Ott, H.R. Page (*Emeritus*), C.M. Paik, Y.S. Park, P.N. Reeves, S.N. Sherman, R.G. Shouldice, W. Sommers (*Emeritus*), R.McK.F. Southby, J.B. Spain (*Visiting*), S.J. Tolchin, P.B. Vaill, W.J. Winstead (*Visiting*)

Associate Professors W.C. Adams, J.H. Carson, B.L. Catron, J.P. Coyne, G.E. Crum, H.J. Davis, S.R. Eastaugh, J.D. Frame, D.E. Gale, L. Graff, W. Greenberg, E.W. Hahn, W.W. Hardgrave, R.L. Holland, D.J. Lenn, M.L. Liebrenz, S.D. Lind, J. Lobuts, Jr., R.W. Longstreth, L.M. Maddox, P.B. Malone III, J.F. McCarthy, Jr., A.E. Merget, T.J. Nagy, K. Newcomer, J.H. Perry, J.M. Sachlis, J.B. Thurman, S. Umpleby, C.W. Washington, W.G. Wells, Jr., E.K. Winslow, D.L. Zalkind

Assistant Professors A. Anckonie III (*Visiting*), T.M. Barnhill, N.G. Cohen, N.J. Crimm, M.J. Enders, E.J. Englander, D.R. Kane, M.S. Katzman, J. Liebowitz, W. Margrabe, L.C. Moersen, P.S. Peyser, C.J. Prager (*Visiting*), F. Robles, D.R. Sheldon, C.C. Shepherd, Jr., T.F. Shine (*Visiting*), L.G. Singleton, M.L. Slagle, K.E. Smith, G.K. Swensen, W.F. Thomas, G.C. Wooding

Instructor D.M. Mattison

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* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are *ex officio* members of the Faculty of the School of Government and Business Administration.

Committees*

DEAN'S COUNCIL

B.L. Catron, J.P. Coyne, S. Greene, F.C. Kurtz, Y.S. Park, R.G. Shouldice

COMMITTEE ON CURRICULUM AND PROGRAMS

B. Burdetsky, S.R. Chitwood, K.J. Darr, J. Lobuts, Jr., W. Margrabe, D.C. McGrath, Jr., D.R. Sheldon

COMMITTEE ON DOCTORAL STUDIES

D.E. Gale, W.W. Hardgrave, M.M. Harmon, J. Hilmy, S.D. Lind, P.S. Peyser, P.N. Reeves

COMMITTEE ON MASTER'S STUDIES

G.E. Crum, R.F. Dyer, S.S. Fuller, M.G. Gallagher, L. Graff, M.M. Harmon, J.F. Lobuts, Jr.

COMMITTEE ON UNDERGRADUATE STUDIES

J. Liebowitz, M.L. Slagle, K.E. Smith, G.W.G. Stoner, C.W. Washington

INTRODUCTION

Organized as the School of Government in 1928, the School of Government and Business Administration has been responsible for over half a century for the professional development of individuals assuming membership and leadership roles in society. The School comprises six departments—Accountancy, Business Administration, Health Services Administration, Management Science, Public Administration, and Urban and Regional Planning. The use of a multidisciplinary approach in educational programming helps prepare both the generalist and specialist for professional careers in today's complex, organizational society.

Purposes

The School of Government and Business Administration is dedicated to academic excellence through the study, teaching, and research of management and policy in the public and private sectors, both within the United States and internationally.

Over a span of half a century, the School of Government and Business Administration has developed a learning community in which mature individuals can prepare themselves to assume membership and leadership roles in society. The School practices a multidisciplinary approach with flexibility in educational programming in the belief that such is essential to dealing with the complexities of today's organizational society. The School offers preparation of both the generalist and the specialist for professional careers and seeks to improve the quality and character of the individual as citizen, professional, and scholar as well.

More specifically, the purposes of the School are

1. To prepare its graduates for positions in the management of complex organizations.
2. To provide a broad and fundamental education as preparation for positions carrying management and leadership responsibilities.

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* The Dean of the School is an *ex officio* member of all committees.

3. To provide specialized educational opportunities as preparation for career positions in professional disciplines or functional areas.

4. To explore in all their forms, through education and research, the content, interactions, and interdependencies of disciplines and institutions in the public and private sectors, both nationally and internationally.

5. To make available the School's resources to business, health, government, community, and other organizations in both the metropolitan area and the larger community.

6. To foster understanding and advancement of knowledge and skills in the world community through research, education, and scholarly exchange with governments, institutions, and organizations engaged in the solution of international trade and investment problems and in the management of human settlements.

Academic Status

The School of Government and Business Administration has maintained full membership in the Middle Atlantic Association of Colleges of Business Administration since 1961. It joined the Council on Graduate Education for Public Administration in 1966. In 1968, the School became a member of the American Assembly of Collegiate Schools of Business, and the undergraduate and master's programs in business administration are accredited by the Assembly. The program in health services administration is accredited by the Accrediting Commission on Education for Health Services Administration. The Master of Urban and Regional Planning degree program is recognized by the American Planning Association. The School is a member of the National Association of Schools of Public Affairs and Administration (NASPAA), and its Master of Public Administration degree appears on the NASPAA list of approved schools.

Fellowships

The School of Government and Business Administration has several graduate fellowships available to its students, including the Aryamehr Research Fellowships in International Business, the Government Intern Scholarship Program, Health Services Administration Fellowships, Ernst and Whinney Grants to Doctoral Candidates in Accounting, the National Association of Purchasing Management Fellowship, the Scottish Rite Foundation Fellowships, the Wolcott Foundation Scholarships, the Minority Students Fellowships for both graduates and undergraduates, and the Hyundai Foundation Scholarships in International Business; Information Systems; Procurement and Contracting; and Science, Technology, and Innovation.

REGULATIONS

See Admissions, Registration, Fees and Financial Regulations, and Regulations.

Attendance

A student may not attend classes until registration is completed and fees due are paid. A student may be dropped from any course for undue absence.

The student is held responsible for all of the work of the courses in which registered, and all absences must be excused by the instructor in charge before provision is made for the student to make up the work missed.

A student suspended for any cause may not attend classes at GWU during the period of suspension.

Withdrawal

Withdrawal from a course or from the University without academic penalty is permitted during the first five weeks after registration for the fall or spring semester. Withdrawal after this period is permitted only in unusual circumstances and requires certification by the instructors of courses for which the student is registered that the student is doing passing work (see Withdrawal, under Regulations).

Adding Courses

Courses may not be added after the first two weeks of classes in any semester.

Independent Study Plan

A student of *demonstrated capacity*, with a special interest in the subject matter of a course, may be permitted to undertake study under the personal direction of an instructor, in accordance with the rules of the appropriate department. Credit under this plan is limited to the specific course credits normally allowed when taken on a class basis.

Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the dean. The dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up such deficiency in English to the satisfaction of the dean.

Students from Other Schools Within the University

Degree candidates from other schools of the University cannot register for more than 12 hours of credit in courses from the Bachelor of Accountancy, Master of Accountancy, Master of Taxation, Bachelor of Business Administration, or Master of Business Administration degree programs. Typically, a maximum of 6 hours of credit is permitted in courses from the Bachelor of Accountancy program, unless an advisor recommends an additional 3 credit hours.

Common Body of Knowledge

Programs leading to the degrees of Bachelor of Accountancy, Bachelor of Business Administration, Master of Accountancy, Master of Taxation, and Master of Business Administration include the equivalent of at least one year of work in the following areas:

1. a background of the concepts, processes, and institutions in the production and marketing of goods and services and the financing of the business enterprise or other forms of organization;
2. a background of the economic and legal environment as it pertains to profit and nonprofit organizations, along with ethical considerations and social and political influences as they affect such organizations;
3. a basic understanding of the concepts and applications of accounting, quantitative methods, and information systems;
4. a study of organization theory, behavior, and interpersonal communications;
5. a study of administrative processes under conditions of uncertainty, including integrating analysis and policy determination at the overall management level.

THE BACHELOR'S DEGREES

The School offers programs leading to the degrees of Bachelor of Accountancy and Bachelor of Business Administration with fields of instruction in business economics and public policy; finance; information processing; international business; logistics, operations, and materials management; marketing; and personnel management.

ENTRANCE REQUIREMENTS

Good character and an academic background appropriate for the program of studies contemplated are required.

Requirements for admission to the freshman class include

1. An acceptable certificate of graduation from a U.S. secondary school showing at least 15 units,* which must include four years of English; at least two years of one foreign language; two years of science, preferably with laboratory instruction; two years of social studies, one of which must be American history; and one year of college-preparatory mathematics beyond introductory algebra.

International students may be considered for admission with an equivalent foreign secondary certificate. A student presenting a U.S. secondary certificate or its foreign equivalent must also show competence in the English language by scoring not less than 550 on the first taking of the TOEFL or 600 on the second taking. International students may be required to enroll in a full-time program in English before beginning studies in a degree program.

2. College Board scores submitted on the Scholastic Aptitude Test. (Normally, students with SAT verbal scores below 450 or SAT math scores below 500 will not be admitted.)

Criteria for admission include a strong high school record and a satisfactory performance on the Scholastic Aptitude Test examinations. It is recommended that the examinations be taken in December or January. Scores on tests taken in the junior year may be submitted. Arrangements for tests are the responsibility of the applicant and should be made with the Educational Testing Service, 20 Nassau St., Princeton, N.J. 08541, or 1947 Center St., Berkeley, Calif. 94704, not less than one month before the date of the test. In applying for the test, the applicant should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

The College Board tests are preferred; however, the American College Testing battery scores will be accepted. The applicant should request that these scores be sent to the Office of Admissions directly from the American College Testing Program, Iowa City, Iowa. It is recommended that the applicant take the tests in October of the senior year.

Admission with Advanced Standing

Requirements for admission of students transferring from other regionally accredited colleges and universities and from other divisions of this University are as follows.

Ordinarily, students who have accumulated no more than 30 semester hours of transferable relevant academic credit must have a minimum 2.00 cumulative grade index and meet the freshman requirements. Students who have accumu-

* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.

lated 31 to 90 transferable semester hours of relevant academic credit must have a 2.50 or higher cumulative grade index. Advanced standing may be awarded for properly certified courses taken at regionally accredited colleges or universities for which the student received a grade of C or better, and may be applied toward a degree, provided they are comparable to the curricular requirements of the degree.

In no case will more than 60 semester hours of advanced standing be granted for course work completed at regionally accredited community or junior colleges. These 60 hours may include credit granted for completed course work equivalent to BAd 104, Mgt 58, or Mgt 119. Other courses (one course per area up to a maximum of three courses), comparable to this School's courses numbered 101–200, taken at an accredited community or junior college with an earned grade of C or better, may be accepted to waive certain required courses. The waiver of a required course does not entitle the student to any semester hours of credit and does not reduce the total number of credits that must be completed to earn the degree.

Although a grade of *D* is not acceptable for transfer of credit, the course may be used to waive a comparable curricular requirement. Credits earned with a *D* grade may not, however, be counted toward the total number of semester hours required for the degree. Any course completed with a grade of *D* or better may not be repeated for the purpose of earning degree credit. An exception to this rule is the freshman English composition requirement and all accountancy courses. Any student earning a *D* in such courses at another institution may be required to repeat the courses at this University.

The School reserves the right to refuse credit for transfer in whole or in part or to allow credit provisionally. No more than 3 credit hours per course will be accepted as transfer credit.

It is the responsibility of the student to have an official transcript sent directly from each institution formerly attended to the Office of Admissions, Rice Hall, George Washington University, Washington, D.C. 20052.

A student wishing to transfer into the School from another division of this University must submit a formal application of transfer to the Office of Admissions in Rice Hall.

Courses taken at another division of this University may be applied toward a degree in this School, provided they are comparable to the curricular requirements of the degree. A maximum of 90 semester hours of transfer credit may be applied toward a degree program in this School.

In no case will credit for more than 15 semester hours of undergraduate course work taken at this University in nondegree status be allowed toward meeting degree requirements in the School of Government and Business Administration.

Readmission

A student who withdraws, is suspended, or is otherwise absent without authorization from the University for one semester or more must make formal application for readmission. If readmitted, the student is subject to the rules and regulations in force at the time of return. If the student has attended one or more regionally accredited colleges or universities during absence from the University, complete official transcripts must be sent to the Office of Admissions from each institution attended.

The application fee is waived for a student applying for readmission who was registered as a degree candidate at the time of last registration at the University and has not since registered at another college or university.

DEGREE REQUIREMENTS

Academic Work Load

A full-time student not on probation may not ordinarily take more than 15 semester hours. A student employed more than 20 hours a week, who is not on probation, may not take more than nine semester hours.

A full-time student whose overall quality-point index is 3.50 or higher may take up to 18 semester hours. A student employed more than 20 hours a week, whose index is 3.50 or higher, may take up to 12 semester hours.

A student who accepts employment after registration or at any time during a semester must report immediately to the dean so that the program may be adjusted if necessary.

Exceptions to these rules require the approval of the dean.

An undergraduate student on probation may take no more than 12 semester hours of course work.

Scholarship Requirements

A student must have the following to graduate: (1) an overall quality-point index of at least 2.00 and (2) a quality-point index in the major field of instruction of at least 2.00. All courses that are acceptable for credit toward the bachelor's degrees are to be included in the *overall quality-point index* calculation. Elective courses in or out of the School of Government and Business Administration cannot be used as substitutes for required courses in the calculation of the *major quality-point index*. Only required 100-level B.B.A. or B.Acct. courses and major-related courses are used in the *major quality-point index* calculation.

DEAN'S HONOR LIST

The names of students who achieve a quality-point index of 3.50 or higher are placed on the Dean's Honor List for that semester. Appearance on the list is limited to (1) full-time students registered for a minimum of 12 semester hours (provided that the 12 hours are taken for a grade) and (2) part-time students registered for a minimum of 12 semester hours over a period of two consecutive semesters, which may include a summer term.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described under Regulations.

The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An Incomplete that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here or by taking its equivalent elsewhere.

The grade of *Z* (Unauthorized Withdrawal) is assigned when students are registered for a course they have not attended and in which they have done no substantial graded work. The grade of Z is not calculated in the overall and major quality-point indexes.

PROBATION

A student whose quality-point index (either overall or in the major) falls below 2.00 after completing a minimum of 12 semester hours of study will be placed on probation. This probation extends over the period in which the student attempts another 12 semester hours of work, which may include remedial studies as prescribed.

SUSPENSION

A student whose quality-point index (either overall or in the major) is 1.50 or below in any semester or remains below 2.00 at the end of the probationary period will be suspended. A student suspended for poor scholarship may apply for readmission after the lapse of the following fall or spring semester. To be considered for readmission, the student must pass prescribed tests and or submit evidence of conduct during absence from the University that indicates that the student will profit from readmission. A student readmitted after suspension is on probation and must maintain a current quality-point index of at least 2.50 for each 12 semester hours of work undertaken until the cumulative (or major) index is 2.00. In no case will the probationary period after readmission exceed 24 semester hours of study. A student suspended twice for poor scholarship will not be readmitted.

PASS/NO PASS OPTION

A junior or senior student who has a cumulative quality-point index of 2.50 or better may, with the approval of the advisor and the dean, take one course a semester and receive a grade of *P*, Pass, or *NP*, No Pass, which will be recorded on the student's transcript but will not be reflected in the quality-point index. No student will be allowed to take more than four pass no pass courses. A student must sign up for such an option at registration. Under no circumstances may a student change from pass no pass status to graded status, or vice versa, after the end of registration (except in the case of a prerequisite to Math 51). Required courses may not be taken on the pass no pass basis. A transfer student may not choose this option until the second semester of enrollment in the University.

Residence

A minimum of 30 semester hours, including at least 12 semester hours in required B.B.A. or B.Acct. courses, must be completed while registered in the School of Government and Business Administration. This requirement applies to students transferring within the University as well as to students transferring from other institutions. Unless special permission is granted by the dean to pursue work elsewhere, the work of the senior or final year must be completed in the School of Government and Business Administration.

Correspondence and Home-Study Courses

Credit for correspondence or home-study courses is not acceptable and cannot be applied toward a degree in this School.

Earning Credit or Waiving Requirements by Examination

A student may earn credit up to a maximum of 30 semester hours or waive curricular requirements by performing satisfactorily on the following tests:

College-Level Examination Program (CLEP)—See Admissions for general information on the CLEP tests. CLEP tests in Introduction to Business,

Commercial Law, and Data Processing are limited to three credits each of advanced standing. CLEP tests in college algebra/trigonometry, English composition, and more advanced courses in accounting and business administration are not accepted for advanced standing. Students enrolled in George Washington University who wish to receive credit for CLEP Subject Examinations must receive prior approval of the department.

Advanced Placement Tests—See Admissions.

Achievement Tests—See Admissions.

Examinations for Waiving Curriculum Requirements—The School of Government and Business Administration does not administer waiver examinations. However, certain arts and sciences courses may be waived, and in some instances credit may be assigned, by satisfactorily passing a special departmental examination authorized and prescribed by the department or curricular advisor concerned. Requests to take the examination should be made to the curricular advisor and the required fee paid at the Office of the Cashier before the date set for the examination. See page 73 for more information.

Cooperative Education Program

The School of Government and Business Administration has entered into several Cooperative Education agreements with U.S. government agencies in the Washington, D.C., area. Students who are selected to participate in these programs generally work in paid employment for one semester and attend school the next semester. Since these programs are currently designed for juniors and seniors, program length is for one- and two-year periods. The areas of work are closely integrated with the student's major field of instruction (e.g., marketing, finance, personnel, etc.). Interested students should contact the Chairman, Department of Business Administration, for specific guidance and details.

THE BACHELOR OF ACCOUNTANCY

The principal objective of the Bachelor of Accountancy degree is preparation for a professional career in accounting. Although professional preparation requires specialization in the acquisition of accounting knowledge in the junior and senior years, attainment of the objectives requires a general education in English, humanities, social sciences, mathematics, and sciences in the first two years of undergraduate study. In addition, a common body of knowledge in business administration is necessary during the junior and senior years, with special reference to the needs of the student in the accounting program. An additional objective is the preparation of students for a fifth-year or Master of Accountancy program that is intended to meet the academic needs of students seeking professional accounting careers in the public or private sector, which currently demand high entry-level academic achievement.

One hundred twenty semester hours are required for graduation. Courses must be taken in accordance with the academic status of the student (i.e., freshman, sophomore, junior, senior) and the course prerequisites.

Math 3, 6, 9, and 10 may not be used for credit toward the Bachelor of Accountancy.

Curriculum for the Pre-Accountancy Program*

FRESHMAN YEAR

		Semester Hours
Economics:	Econ 1–2	6
English:	Engl 9 or 10, 11	6
Mathematics:	Math 31–32 or 51–52†	6
Science:	BiSc 3–4; Chem 3–4; Geog 1, 2; Geol 1–2; or Phys 9–10	6
Social Sciences:	PSc 2, Soc 1	6
	Total	30

SOPHOMORE YEAR

Accountancy:	Acct 51–52	6
Economics:	Econ 121	3
Social Sciences:	Psyc 1 and 8; Phil 45 or 50 and 135	12
Statistics:	Stat 51	3
Communication:	CmTr 111	3
Computer Studies:	Mgt 58	3
	Total	30

Curriculum for the Accountancy Program

JUNIOR YEAR

Acct 101:	Cost and Budgetary Control	3
Acct 121:	Intermediate Accounting	3
Acct 151:	Business Law for Accountants I	3
Acct 152:	Business Law for Accountants II **or**	
Acct 162:	Federal Income Taxation of Corporations	3
Acct 161:	Federal Income Taxation, Individuals	3
Acct 191:	Advanced Accounting	3
BAd 120:	Business Finance	3
BAd 140:	Basic Marketing Management	3
BAd 191:	Fundamentals of Management	3
Engl 100:	Expository Writing in Accounting	3
	Total	30

SENIOR YEAR

Acct 132:	Accounting Theory	3
Acct 171	Auditing	3
Acct 181	Accounting Systems	3
BAd 101	The Business Environment	3
BAd 110:	Personnel Management *or*	
Mgt 107	Fundamentals of Behavioral Science	3
BAd 160:	Introduction to International Business **or**	
BAd 166	International Marketing Management **or**	
BAd 171	International Business Finance	3
BAd 188	Managing Production Operations	3

* To be accepted in the Bachelor of Accountancy program a cumulative quality point index of 2.50 or higher is required at the start of the junior year.

† Math 51–52 is designed especially for students in accountancy, business administration, and the social sciences.

BAd 197:	Strategy Formulation and Implementation	3
Stat 103:	Sampling in Accounting	3
Elective:	Chosen from Columbian College or the School of Government and Business Administration. Qualified students accepted in the Accounting Internship Program will elect Acct 199	3
	Total	30

ACCOUNTING PRACTICE INTERNSHIP

An internship program, limited to selected senior accounting majors, is available during the semester break of the senior year. To be admitted to this program students must have the approval of the chairman of the Department of Accountancy and must have completed at least 15 semester hours of accountancy courses, including a course in auditing, by the end of the fall semester of the senior year, with a quality-point index of 3.0 both in accountancy courses and overall at the start of the fall semester of the senior year. Students will be paid a salary while conducting audits under senior supervision of participating C.P.A. firms. Students who complete the internship successfully will register for Acct 199 the spring semester of their senior year and will receive 3 semester hours of credit. For further information consult the chairman of the Department of Accountancy.

THE BACHELOR OF BUSINESS ADMINISTRATION

One hundred twenty semester hours of course work are required for graduation. To be recommended by the Faculty for graduation, candidates are required to complete, in addition to the appropriate freshman and sophomore work, a minimum of 60 semester hours of course work in the junior and senior years selected from one of the fields of instruction offered by the School. Courses must be taken in accordance with the academic status of the student (i.e., freshman, sophomore, junior, senior) and the course prerequisites. The major field of instruction must be selected at the end of the sophomore year.

Math 3, 6, 9, and 10 may not be used for credit toward the B.B.A. degree. The second semester of a first-year language course that was previously studied in high school may be taken as a sophomore elective, provided the student places (via test) at this level.

Curriculum for the First Two Years for All Bachelor of Business Administration Students

FRESHMAN YEAR

		Semester Hours
Mathematics:	Math 31–32 or 51–52*	6
Economics:	Econ 1–2	6
English:	Engl 9 or 10, 11	6
†Science:	BiSc 3–4; Chem 3–4; Geog 1, 2; Geol 1–2; or Phys 9–10	6
†Social Sciences:	AmCv 71–72; Anth 1–2; Hist 39–40 or 71–72; PSc 1, 2; or Soc 1, 2	6
	Total	30

* Math 51–52 is designed especially for students in accountancy, business administration, and the social sciences.

† With the approval of an advisor, students may petition the dean for approval of another appropriate combination of courses.

SOPHOMORE YEAR

Accountancy:	Acct 51–52	6
Business Administration:	BAd 51	3
Humanities:	Art 31–32 or 71–72; Chin 3–4; Engl 51–52, 71–72, or 191–92; Fren 3–4 or 6, or 51–52; Ger 3–4 or 51–52; Ital 3–4; Mus 3, 4; Phil 45, 50, or 71; Rel 9–10, 21, 22, 23, 59, 60; Slav 3–4, 5–6, or 91–92; Span 3–4 or 6, or 51–52; or CmTr 1, 11, or 111	6
Management Science:	Mgt 58	3
Social Sciences:	Psyc 1, 8	6
*Elective:	Courses other than accountancy, business administration, or economics	3
Statistics:	Stat 51	3
	Total	30

Curriculum for B.B.A. Fields of Instruction

The academic programs comprising these fields of instruction are designed to provide the broad foundation required for eventual leadership in either business or governmental administration. Each field of instruction consists of 33 semester hours of required general business administration courses and 15 hours of required field-related courses. Nine hours of electives, normally advanced courses in liberal arts subjects, are required in each field but are not included in the calculation of the field quality-point index.

JUNIOR YEAR

Required General B.B.A. Courses		
Acct 193:	Business Budgeting	3
BAd 110:	Personnel Management	3
BAd 120:	Business Finance	3
BAd 140:	Basic Marketing Management	3
BAd 191:	Fundamentals of Management	3
Econ 121:	Money and Banking	3
Field-Related Courses:	Six semester hours selected from among courses in the chosen field of instruction	6
Elective:	To be selected in consultation with the advisor	6
	Total	30

SENIOR YEAR

Required General B.B.A. Courses		
BAd 101	The Business Environment	3
BAd 104	Commercial Law	3
BAd 188	Managing Production/Operations	3
BAd 197	Strategy Formulation and Implementation	3
†Psyc 144 Mgt 107	Personnel and Industrial Psychology **or** Fundamentals of Behavioral Science	3

* Restricted to lower than 100-level courses. (Courses in human kinetics and leisure studies may not be taken for credit.)

† Students in marketing should complete BAd 142, Consumer Behavior, in lieu of this requirement.

Field-Related Courses:	Nine semester hours selected from among courses in the chosen field of instruction	9
Elective:	To be selected in consultation with the advisor	6
	Total	30

The field of instruction should be selected at the end of the sophomore year. The student should contact the Assistant Dean for Undergraduate Programs for the assignment of a faculty advisor. Field-related courses for business economics and public policy; finance; information processing; international business; logistics, operations, and materials management; marketing; and personnel management are described below. An asterisk preceding a course number indicates that the course is required for that field of instruction.

1. Business Economics and Public Policy

This field is directed toward developing understanding and skills applicable to a wide variety of positions in business and government. Students will supplement basic course work in business and economics with additional courses in economics, political science, and government–business relations. The social, legal, political, and economic environment of business and the micro- and macroeconomic foundations of governmental programs and regulatory activity will be studied to establish a basis for developing and evaluating effective business responses. The program is concerned with the continuing business–government dialogue on effective and equitable relations between the two sectors of the economy.

The following courses provide a basic academic foundation in the field of business economics and public policy:

BAd 117:	Collective Bargaining
BAd 171:	International Business Finance
*Econ 101:	Intermediate Microeconomic Theory
*Econ 102:	Intermediate Macroeconomic Theory
Econ 136:	Natural Resources and Environmental Economics
Econ 158:	Industrial Organization
Econ 159:	Government Regulation of the Economy
Econ 161:	Public Finance I
Econ 162:	Public Finance II
Econ 181–82:	International Economics
PSc 116:	The American Presidency
PSc 117:	Public Administration and Bureaucratic Politics
PSc 118:	Legislative Process
PAd 125:	Managing Public Policy

2. Finance

This field helps students develop the skills required for entry-level employment in corporations, financial institutions, and the public sector. Corporations employ entry-level finance specialists for cash, credit, or inventory analysis or management and for work in bank relations and capital budgeting. Financial institutions offer opportunities for entry-level finance specialists to analyze specific securities and to assist in loan analysis. The government sector looks to finance majors as potential financial analysts. The undergraduate B.B.A. degree with a finance major also provides an excellent foundation for graduate academic programs, especially the study of law.

The following courses provide a basic academic foundation in the field of finance:

Acct 111:	Financial Statement Analysis **or**
Acct 121:	Intermediate Accounting
*BAd 123:	Investment and Portfolio Management
*BAd 124:	Advanced Financial Management
BAd 130:	Working Capital Management

BAd 132: Real Estate Investment **or**
BAd 133: Fundamentals of Insurance and Risk Management
BAd 135: Capital Formation
BAd 171: International Business Finance

3. Information Processing

Students taking this field are recruited by organizations in both the public and private sectors for positions as programmer analysts and systems designers. These entry-level positions lead to careers in the marketing of computer hardware and software, systems consulting, and management. Medium to large organizations are currently expanding their reliance on computer systems, and with the development of inexpensive but powerful mini- and microcomputers, thousands of smaller organizations are finding computers to be cost effective as well.

Students will supplement the basic skills learned in the B B A curriculum with courses planned to provide a firm foundation in the use of the computer as a tool in solving information problems in organizations. These courses relate ongoing, real-world applications of computers to the functional areas of business and government organizations.

The following courses provide a basic academic foundation in the field of information processing:

†CSci 157: Machine and Assembly Language Programming
†CSci 158: Algorithmic Methods and High-Level Languages
*Mgt 119: Computer Programming for Information Systems
*Mgt 120: Information Systems Development I
*Mgt 121: Information Systems Development II
*Mgt 122: Special Studies in Information Systems
Stat 130: Computer Programming
Stat 131: Data Structures

4. International Business

This field provides the basic academic foundations for entry-level positions in international business, particularly in multinational corporations, international banks, and government agencies. Such organizations include the Departments of Commerce, State, and Treasury, plus international institutions such as the Export-Import Bank, World Bank, and Overseas Private Investment Corporation. Students in this field are encouraged to include two years of a modern foreign language in their preparatory background.

The following courses provide a basic academic foundation in the field of international business:

BAd 148: Advertising
*BAd 160: Introduction to International Business
*BAd 166: International Marketing Management
BAd 168: Foreign Market Analysis
*BAd 171: International Business Finance
BAd 173: International Banking
BAd 175: International Monetary and Financial Issues
Econ 181: International Economics
T&T 104: Introduction to Travel and Tourism

5. Logistics, Operations, and Materials Management

Students in this field will become equipped to contribute to the national effort to achieve economy, efficiency, and innovative competitive behavior for the American economy. Many positions in industry and government that deal with material and service requirements, rates of consumption, acquisition, mobility, maintenance, and quality

† See the School of Engineering and Applied Science *Bulletin*

assurance require the skills learned in this field. The field is designed to prepare students for entry-level positions performing the activities necessary to plan and control the flow of material through the productive system and the external sourcing of required goods and services.

Graduates of the program will be prepared for career positions in government, industry, and consulting firms in such functional management areas as contract administration, purchasing, materials and logistics, maintenance, quality assurance, planning, requirements, project administration, price analysis, and contract administration or in support work.

The following courses provide the foundation for effective functioning in the field of logistics, operations, and materials management:

*BAd 180:	Materials and Purchasing Management
BAd 181:	Management of Public Acquisitions
BAd 182:	Transportation Management
*BAd 183:	Logistics Management
*BAd 184:	Contract Management

6. Marketing

This field has the objectives of (1) developing a conceptual understanding of a complex and changing environment and its effects on marketing activities and institutions, (2) understanding the dynamics of buyer behavior, (3) providing the skills to analyze demand, market segments, and cost–volume profit relationships of marketing programs, (4) enhancing abilities in written and verbal communications, and (5) developing skills in formulating and implementing comprehensive marketing plans.

Typical entry-level positions for students with marketing majors are: advertising account executives, marketing research project managers, retail assistant buyers, and sales representatives for consumer or industrial products firms. Students with marketing backgrounds also have obtained positions in physical distribution, public relations, wholesale firms, and a variety of governmental and nonprofit organizations.

The following courses provide a basic academic foundation in the field of marketing:†

*BAd 143:	Marketing Research
BAd 148:	Advertising
BAd 149:	Advanced Advertising Campaigns
*BAd 150:	Sales Management
BAd 152:	Seminar: Retailing Management
BAd 154:	Transportation and Logistics Management
*BAd 159:	Marketing: Strategic Planning
BAd 160:	Introduction to International Business
BAd 166:	International Marketing Management
Jour 145:	Principles and Problems of Public Relations
Stat 105:	Statistics in the Behavioral Sciences
Mgt 119:	Computer Programming for Information Systems

7. Personnel Management

This field is concerned with all aspects of the employment of human resources in business organizations. Entry-level career opportunities are in such fields as personnel management, employee relations, collective bargaining, and manpower utilization. Since the field focuses on the management of human resources in a general sense, this concentration also prepares the student for responsibilities associated with general management and leadership.

The following courses provide a basic academic foundation in the field of personnel management:

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† BAd 142 cannot be used as a field of instruction course.

*BAd 115:	Leadership in Personnel Management
*BAd 117:	Collective Bargaining
Jour 145:	Principles and Problems of Public Relations
Psyc 129:	Theories of Personality
Psyc 131:	Psychological Tests
CmTr 121:	Group Discussion and Conference Leadership

THE MASTER'S DEGREES

ENTRANCE REQUIREMENTS

To be considered for admission, applicants must present a bachelor's degree from a regionally accredited college or university. Application is made directly through the Office of Enrollment Development and Admissions, School of Government and Business Administration. Admission to master's programs is granted on a highly competitive basis. Previous academic history, performance on the applicable entrance examination, letters of reference, motivation and aptitude to do graduate-level work, and professional experience are all taken into consideration.

Applicants for admission to programs leading to the degrees of Master of Accountancy, Master of Taxation, and Master of Business Administration must submit acceptable scores on the Graduate Management Admission Test; applicants for admission to programs leading to the degrees of Master of Health Services Administration and Master of Urban and Regional Planning must submit scores on the Graduate Management Admission Test or the Graduate Record Examination; applicants for admission to programs leading to the degree of Master of Public Administration, Master of Association Management, and Master of Science in Information Systems Technology must submit scores on the Graduate Record Examination. It is the responsibility of the applicant to make arrangements for the required test with the Educational Testing Service, Princeton, N.J. 08541. Correspondence concerning the Graduate Management Admission Test should be addressed to Box 966; concerning the Graduate Record Examination, to Box 955. Test scores that are more than five years old are not accepted for admissions review.

International students must show competence in the English language by scoring not less than 550 on the first taking of the Test of English as a Second Language (TOEFL) or 600 on the second taking. International students may be required to enroll in a full-time program in English before beginning studies in a degree program.

GENERAL REQUIREMENTS

All students must complete the prescribed minimum number of semester hours of graduate course work. A maximum of one-quarter of the semester hours of graduate course work required for a degree may be approved for transfer to the School of Government and Business Administration from the Division of Continuing Education and Summer Sessions, another degree-granting division of this University, or another regionally accredited college or university under the following conditions: The course work must be approved as part of the student's program of studies; it must not have been applied to the completion of requirements for another degree, it must be at the graduate level, it must have been taken within the two years prior to acceptance into the program, and the student must have received a grade of *B* or better. This action must be approved

by a petition to the designated faculty advisor and the dean. A transcript and description of the course work must be on file before the petition can be considered. Should advanced standing be granted, the credit will count; however, the grade will not be used in calculating the cumulative grade point average.

Extended programs, including undergraduate background courses, may be assigned for an applicant whose undergraduate degree was in a field other than the graduate program the student wishes to follow or whose undergraduate record indicates a weakness in required background courses.

Master's degrees are awarded by vote of the Faculty on completion of the required course work, completion of an acceptable thesis (if one is elected or required) or the equivalent work, and the passing of the Master's Comprehensive Examination if required in the chosen degree or field of instruction.

Second-group courses (numbered 101–200) may be counted toward the master's degree only when registration for graduate credit has been approved at the time of registration by the dean and the designated faculty advisor. No work counted toward a bachelor's degree may be counted toward a master's degree.

Full-time students are expected to register for a minimum of 9 to a maximum of 12 semester hours each semester. A graduate student who is employed more than 20 hours a week may not take more than 6 semester hours. All work for a master's degree *must be completed in five years*, unless an extension of time is granted by the dean.

Students who expect to continue studies for the degree of Doctor of Business Administration or Doctor of Public Administration after receiving the master's degree should ask for assistance in planning programs so that they may qualify for admission to candidacy for the doctorate.

No credit is granted for work done in absentia or without formal instruction, except for hospital residency, supervised field experience, and the thesis, which may be completed in absentia with the permission of the department, designated faculty advisor, or committee concerned.

MASTER'S COMPREHENSIVE EXAMINATION

Written Master's Comprehensive Examinations are required only in certain degrees and fields of instruction. Degree candidates should consult designated faculty advisors about examinations required and material to be covered. In writing the examinations students are expected to correlate what has been learned in course work and from the literature of the field. The examinations normally require four to eight hours. Sections broadly cover the various fields that the candidate has selected.

Examinations are generally scheduled in the fall and spring semesters and should be taken during the last semester of course registration or shortly after completion of prescribed course work.

A written application is filed with the department supervising the student's field of study at the time of registration for the semester in which the examination is to be taken. Before applying, the student must have completed all courses in the program or be enrolled in the last semester and must have achieved a 3.00 (*B*) average. After applying for the examination, a candidate may withdraw only by written notice to the department chairman.

A candidate who fails the examination should consult with the designated advisor about a subsequent course of action.

SCHOLARSHIP REQUIREMENTS

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *CR*, Credit; *W*, Authorized Withdrawal; and *Z*, Unauthorized Withdrawal.

An average of *B* or better is required for the master's degree. The grade of *C* is not considered as failing but must be balanced by a grade of *A* in a graduate course of equal status. A minimum grade point average of 3.00 is required for award of a graduate degree. All courses taken after matriculation as a degree candidate (except those audited or taken for the grade of *CR*) will be used in the calculation of the grade point average.

A student whose quality-point index falls below 3.00 will be placed on probation. This probation extends through the period in which the student next attempts 12 semester hours of work, including prescribed courses. During this period the student's performance will be monitored to determine suitability for continued study. A student who is subject to probation for a second time is automatically suspended.

A master's degree candidate who receives a grade of *F* is required to present cause, for consideration by the dean, as to why continued study should be permitted.

A master's degree candidate given the grade of *F* in a required course, and permitted to continue in graduate studies, must repeat the course and achieve at least the grade of *B*. (Such a repeat does not expunge the grade of *F*, which remains part of the student's record.) Should this level of performance not be obtained, the student will be denied further registration as a degree candidate.

Suspension

A graduate student who does not meet the conditions of probation (see above) will be suspended. A student who is suspended or withdraws under these conditions may apply for readmission after the lapse of one semester. To be readmitted the student must submit evidence that indicates academic success if readmitted. A student so readmitted will continue on academic probation and must achieve a minimum quality-point index of 3.50 in the next 12 semester hours of graduate study. Should the student fail to achieve this minimum quality-point index, a second suspension will result and subsequent readmission will be denied.

Incomplete/Authorized Withdrawal

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described under Regulations.

The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An Incomplete that is not removed within this period is automatically changed to an *F*. In cases of well documented extenuating circumstances, an instructor and a student may jointly petition the dean for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here or by taking its equivalent elsewhere.

The Thesis

Students contemplating doctoral study are strongly urged to include the thesis as an elective in their master's program. The thesis subject should be selected as early as possible to permit effective integration with the course work.

The subject must be approved by the professor in charge of the student's field. The thesis in its final form must have the approval of the professor in charge and must be presented to the dean by the student no later than the date announced in the calendar. Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Office of the Dean.

Payment of tuition for the thesis entitles the candidate, during the two semesters in which registered for thesis (299–300), to the advice and direction of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished, additional time is granted. The student must, however, be enrolled continuously in the program. If the preparation of the thesis extends more than three semesters beyond the date registered for thesis research, the student must register for the entire required hours of thesis again and pay tuition for the two repeated courses.

MASTER OF ACCOUNTANCY

The Master of Accountancy degree is designed to prepare students for professional careers in accounting. Although accounting careers may be in the public or private sector, a particular objective of the program is the student's attainment of professional certification. The Master of Accountancy is recognized as the necessary fifth year of education in a professional accounting program, and as such, it is superimposed on a Common Body of Knowledge in accounting and business subjects. The Common Body of Knowledge is ordinarily attained by the completion of a bachelor's degree in accounting or business from a regionally accredited institution of higher education.

The program consists of 60 semester hours of course work, of which 27 may be waived if comparable study has been completed prior to admission. Six semester hours of course work of the minimum program of 33 hours may be awarded as advanced standing.

Students should verify state regulations concerning the Certified Public Accountant Examination for the state in which they plan to practice.

The program of study consists of two levels.

First Level: Common Body of Knowledge Courses (30 semester hours)

Acct 201, 202, 211, 297; BAd 220, 240; Econ 217; Mgt 205, 218, 270

This set of courses must be completed prior to enrollment in Second-Level courses, except Acct 297, which must be taken in the last semester of the program. All of these course requirements, except Acct 297, may be satisfied by evidence of successful completion of comparable work at other regionally accredited institutions. First-Level courses may not be taken to satisfy Second-Level requirements or electives.

Second Level:

Acct 221, 225, 251, 261, 275, 282; one course chosen from Acct 262, 263, or 264; and three graduate-level SGBA courses chosen from accounting (other than taxation) and related subjects, with advisor approval.

MASTER OF ASSOCIATION MANAGEMENT

The Master of Association Management is a degree directed to professional careers with associations. It is for practitioners who already work with

nonprofit associations of various kinds—trade associations; public interest associations; professional membership associations; scientific, technical, and learned societies; trade unions; political action committees; and other tax-exempt organizations. It also prepares individuals for the growing opportunities available through work in associations.

The 42-semester-hour program is interdisciplinary, with four academic departments participating in it—Business Administration, Public Administration, Management Science, and Accountancy. Courses are selected from each of six fields of instruction, plus an elective, as follows.

COMPARATIVE INSTITUTIONS (9 hours)

Washington-based associations provide a link between association membership and government. The location of George Washington University in the heart of the nation's capital enables the faculty to be in a special position to observe and know what is happening here.

Required: AM 270 and two additional courses chosen from PAd 212, 213, 215, 216, 242, 245.

MARKETING STRATEGIES AND ASSOCIATION REPRESENTATION (6 hours)

This field emphasizes the importance of the relationship between association managers and members. It also provides the student with an appreciation of what must be done to convey the association point of view to legislators, administrators, and the public at large. The association exists as a central point between various constituencies.

Required: AM 271 and either AM 273 or 274.

COMMUNICATIONS, MEDIA, AND INFORMATION SYSTEMS (6 hours)

Communications is a vital part of modern management. It is particularly important in the management of associations. It involves not only the day-to-day elements of interpersonal communication with board, staff, and members but the preparation, editing, and publication of journals and other written materials and a continuing relationship with the media.

The two required courses are AM 272 and 275.

ASSOCIATION MANAGEMENT (9 hours)

This field addresses the problems of managing association staffs. It concerns itself with the face-to-face relationships between managers and their associates and the problems of large and growing staffs and regional offices.

The two required courses are AM 276 and 279. The latter is a capstone seminar, to be scheduled during the student's final semester. It addresses the overall problems of association management, tying together what has been previously studied, with particular reference to growing legal restrictions that are placed on association managers.

A third course may be selected from PAd 223 or 224; Mgt 210, 212, or 213; or BAd 210.

FINANCE AND ACCOUNTING (3 hours)

AM 277, which addresses the problems of financial planning, budgeting, and accounting that are essential to all association management, is required of all students.

ANALYTICAL AND RESEARCH METHODS (6 hours)

All master's degree students are expected to be familiar with research methods

and statistical applications. In the absence of a thesis, the two required courses are PAd 295 and 296. These courses should be taken early in the program.

ELECTIVE (3 hours)

With the approval of the advisor, the student may choose an elective course either from the above offerings or from other courses in the University.

MASTER OF BUSINESS ADMINISTRATION

The Master of Business Administration degree is designed to prepare students for careers in management. The program of study leading to the Master of Business Administration provides a basic foundation in the functions of business, the environment in which it operates, and the analytical tools needed for intelligent decision making. The program provides a study in depth in one field of instruction and a broad exposure to subjects and issues at the general management level.

The program consists of 60 semester hours of course work, of which 27 may be waived if comparable study has been completed at a regionally accredited college or university prior to admission. Thus the shortest possible program is 33 semester hours.

The program of study consists of two levels and contains four components

First Level: Common Body of Knowledge Courses (30 semester hours)

Econ 217–18; Acct 201; Mgt 205, 218, 270; BAd 201, 220, 240, 297
This set of courses must be completed prior to enrollment in Second-Level courses except BAd 297 which must be taken in the last semester of the program. All of these course requirements, except BAd 297, may be satisfied by evidence of successful completion of comparable work at other regionally accredited institutions. Common Body of Knowledge courses not completed before the applicant matriculates in the School of Government and Business Administration will be assigned in the letter of admission. First-Level courses may not be taken to satisfy Second-Level requirements (breadth, field of instruction, or elective courses).

Second Level:

1. *Breadth Courses (15 hours)*
This set of courses provides exposure to a broad range of subjects intended to develop professional competence in general management. In consultation with the designated faculty advisor, the student selects five courses from at least four teaching fields outside the field of instruction. Thus the student has the flexibility to design a program in consultation with the designated faculty advisor that is tailored to individual career goals.

2. *Field of Instruction Courses (12 hours)*
The purpose of this set of courses is to give the student an understanding in a selected field. Courses are selected in consultation with the designated faculty advisor and may be tailored to individual interests.

3. *Elective (3 hours)*
The student may select any graduate-level course to satisfy this requirement after consultation and approval of the designated faculty advisor.

4. *Required Common Body of Knowledge Course (3 hours)*
This course, BAd 297, Strategy Formulation and Implementation, is a required capstone course for all M.B.A. students. It must be taken in the last semester.

Fields of Instruction

Students select a minimum of 12 semester hours from one of the following fields.

BUSINESS ECONOMICS AND PUBLIC POLICY

This field is directed toward understanding, analyzing, and dealing with the principal forces shaping the total business environment. Special attention is given to the policies and programs of governments, social and cultural change, and the structure, evolution, and fluctuations of the economy. Students concentrating in this area take courses that survey the social, legal, political, and economic environment of business and the micro- and macroeconomic foundations of government programs and of business response to these programs. Elective courses may be chosen in business representation, public decision making, government regulation of business, government–business liaison functions, and public administration.

FINANCE AND INVESTMENTS

This field prepares students for careers in finance and investments, providing a background in business budgeting, controllership, treasury, long-range planning, reporting, and financial management processes. Courses are designed to emphasize the planning, analysis, implementation, and controls necessary for making effective financial decisions. Instruction not only applies to manufacturing and trading enterprise but, in addition, includes railroad and public utility financing. Each, however, has distinctive operating features. Most financial dogmas have a universality that cuts across business lines, and variations are more a matter of degree than of substantive difference.

GENERAL MANAGEMENT SYSTEMS

This field addresses the critical need for management to deal effectively with the fact that human institutions of all kinds tend to become larger and more complex as changes accelerate both socially and technologically. In many traditional academic fields, general systems and cybernetic concepts have evolved as the interdisciplinary mode for understanding increasingly complex systems. This has profound relevance for the contemporary operating manager and policymaker.

Because this program is essentially interdisciplinary and transcontextual in nature, the student is afforded an unusually broad range of opportunities to apply educational experience to managerial, organizational, and societal problems. Professional and academic career potentials are available in the following fields: (1) research and teaching in the growing number of systems and cybernetics oriented programs now emerging in colleges and universities in the United States and elsewhere in the world; (2) institutional environmental interface management or consulting; (3) system-focused organizational development consulting or staff work; (4) corporate and government agency long-range (strategic) planning and control activities; and (5) advisory and staff positions and program directors in global agencies such as operating components of the United Nations, multinational corporations and foundations, and multigovernmental agencies such as OECD, as well as in the agencies and departments of national governments.

INFORMATION SYSTEMS MANAGEMENT

This field is concerned with issues related to modern information and decision support systems in private and governmental organizations. Areas explored in depth include systems analysis, user system psychology, and future trends in information systems.

The program is designed for the professionals responsible for analyzing the information system needs of an organization and developing an implementa-

tion plan for meeting requirements. Plans would deal with the determination of the information needs and information flows within the organization. The information system professional selects the proper blend from the options available: information systems, database management systems, decision support systems, and expert systems. These decisions are based on knowledge of available technology and an understanding of the psychological aspects of user acceptance and productivity.

INTERNATIONAL BUSINESS

This field is designed to prepare students for careers in international banking, international and multinational corporations, and export trading companies; for careers in the federal government and in international agencies concerned with business, industry, and finance abroad; and for the commerce option of the Foreign Commercial Service.

The program is also designed to provide international students with the background and skills necessary to promote international business, and to prepare them for careers in foreign and domestic firms within their own countries and for commercial officer positions within their governments.

Each student's program is individually developed by the student's advisor according to the student's background and interests.

MANAGEMENT OF SCIENCE, TECHNOLOGY, AND INNOVATION

This field explores the many aspects of technology relating to and influencing research and development management, business, and public policy. The employment of state-of-the-art technology and the creation of new technology through research and development are important processes in the achievement of the objectives of both private firms and governments.

The research and development environment has many unique operational characteristics. The concentration has been designed to identify and study the problems associated with managing creative professional people in a dynamic technology. As a contextual area, the program stresses the need for students to undertake original and meaningful research involving political, economic, sociological, and operational problems encountered by management in industrial, governmental, and military research and development organizations.

MANAGEMENT PLANNING AND CONTROL

This field provides an integrated approach to the study of management systems for strategic planning and operational control to improve organizational effectiveness and efficiency in decision making through the use of accounting and interdisciplinary administrative theory and practice. Major topics include scientific methods for acquiring reliable knowledge, accounting and statistical decision theory, models, and the subsystems of the management planning and control systems. Courses encompass centralized and decentralized resource allocation, capital budgeting systems, inventory decisions, matrix algebra, network methods, price–volume decisions, decision making under uncertainty, Bayesian decision theory, and value of information.

MARKETING

This field is devoted to the development of professional marketing managers whose responsibilities may include planning and developing new products, services, and ideas; advertising, selling, and merchandising; and arranging distribution channel systems. Courses cover all aspects of the marketing management function. Foundation courses are Marketing Management, Buyer

Behavior, and Marketing Research. Functional courses are Promotion Management, Marketing Channels, Marketing Strategy, and Product Service Management. Specialized elective courses—International Marketing, Industrial and Government Marketing, and Marketing and Public Policy—utilize the resources of the Washington metropolitan area.

ORGANIZATIONAL BEHAVIOR AND DEVELOPMENT

This field of study reflects the assumptions that the effective utilization of the behavioral sciences is concerned with both means and ends and that the specialist in behavioral science not only is skilled in theory and research but also applies technical and specialized knowledge as a conscious force in effective organizational growth and improvement. Thus, courses are designed to equip the student with organizational concepts and behavioral skills appropriate to optimizing the utilization of a human system's total resources.

This program helps meet the need for professionals capable of designing, creating, and developing the necessary behavioral and organizational systems appropriate to rapidly changing societies. Emphasis is on the interrelationships of such dimensions as motivation, leadership, problem solving, organizational growth, and increased complexity of modern organizations and their effect upon the functions of organizational development.

PERSONNEL MANAGEMENT

This field is concerned with all aspects of the employment of human resources in business organizations. Career opportunities are open in domestic and international business organizations, hospitals, trade associations, research and educational institutions, and local, state, and federal government agencies. Courses encompass all phases of the recruitment, selection, employment, and development of people, industrial relations, unionism, collective bargaining, labor relations, and manpower utilization.

PROCUREMENT AND CONTRACTING

This field responds to a demand for greater professionalism imposed by the increasingly diverse goods and services created by our modern economy. As this diversity grows, organizations find the most efficient, and often the only, method of meeting needs is through procurement action. A sustained growth in purchase volume, variety, and complexity has occurred in both public and private sectors. This growth places ever greater demands upon the skill and resourcefulness of procurement and contracting personnel. The field has therefore been designed with the following objectives: (1) to provide a broad professional education in the knowledge and skills necessary for success in this field; (2) to help the student develop increased ability in analysis, decision making, and communications; and (3) to enhance the student's understanding of the economic, social, legal, and technological considerations present in procurement and contracting activity. This field of instruction is available in an elective field for Master of Public Administration students.

QUANTITATIVE ANALYSIS FOR DECISION MAKING

This field develops a thorough understanding of quantitative or mathematical approaches to problems of managerial control and decision making. While the program will develop a competent background in basic mathematical theory associated with the various techniques, it is oriented toward applications of the technique rather than their theoretical mathematical content.

MASTER OF HEALTH SERVICES ADMINISTRATION

This 54-semester-hour program is designed to provide a core of generalist administrator courses for all students, coupled with specialized elective fields of instruction to meet the interests and career objectives of individual students.

The generalist core includes the following nine courses: HSA 202, 203, 207, 208, 209, 210, 212, 215, and Mgt 210. In addition, each student must take two advanced HSA courses, one chosen from Group I and one from Group II, from among the following:

Group I (Policy/Planning)—HSA 221, 223, 225, 227, 252, 255.

Group II (Management)—HSA 231, 233, 235, 236, 237, 238, 239.

During the last semester on campus, each student must also complete HSA 245 which serves to integrate the concepts and methods of health services administration.

The fields of instruction each comprise 18 credit hours, including an experience-based learning component. In some fields of instruction, a one-year (9-semester-hour) administrative residency is mandatory. In other fields of instruction, the student may choose a 3-semester-hour internship and 6 semester hours of additional course work as a substitute for the 9-hour residency. Consequently, fields of instruction fall into one of two patterns:

Residency Option—Specialist course work, 9 hours; administrative residency, 9 hours.*

Internship Option—Specialist course work, 15 hours; administrative internship, 3 hours.

Courses comprising the field of instruction may be taken in the Health Services Administration Department, the School of Government and Business Administration, the University, or the Consortium of Universities. Each student develops a set of conceptually related courses suitable for the field of instruction and individual career objectives. The choice of courses must be approved by the faculty advisor and the department(s) offering courses.

This curriculum structure gives students an unusual opportunity to develop academic programs particularly suited to their needs. The core courses and the two advanced HSA courses provide students with generalist administrative competence; the nine fields of instruction offer a wide choice of areas in which to develop special expertise. In all but three fields of instruction, students have a choice concerning the amount of experiential learning they wish to include in their programs of study. This choice concerning the amount of field experience can affect the number of months required to complete the program; that is, for a full-time student the residency option will require 28 months, while the internship option will require 20 months.

Fields of Instruction

An asterisk indicates that a 9-credit-hour administrative residency is required in that field of instruction.

* Students will not be permitted to enter any administrative residency unless they have attained a 3.0 grade-point average with no grades of *I*

MANAGEMENT OF ACUTE CARE HOSPITALS*

This field of instruction is designed to provide an understanding of the organization, management, and interrelationships of hospital clinical, support, and administrative functions, and analysis of systems and procedures used to provide short-term inpatient services. Students are also provided with a managerial base in the areas of health services policy-making, regulation, and legislation.

MANAGEMENT OF LONG-TERM SERVICES*

This field explores a wide range of medical and support services required on a recurring or continuous basis by individuals who are unable to function independently because of chronic mental or physical impairment. These services are provided in a variety of settings, including homes for the aged, chronic care, rehabilitation or psychiatric hospitals, hospitals or homes for the mentally retarded and developmentally disabled, geriatric centers, and the client's home. The field also provides a management base in the areas of health services planning, policy-making, regulation, and legislation as applied to long-term care.

MANAGEMENT OF AMBULATORY HEALTH SERVICES*

This field addresses the critical need for managing the delivery of health and medical services to individuals who do not require the constant supervision associated with inpatient care and can either travel to the site where service is provided or be treated in their domicile. Although this definition includes such activities as individual practice of medicine, instruction will focus only on the management of services in organizational settings in which two or more individuals are engaged in delivering ambulatory care as a service offered by a formal organization. Examples of settings for ambulatory services are hospital outpatient departments, medical group practices, health maintenance organizations (HMOs), and public health center clinics. Ambulatory services administrators also work in the areas of health services planning, policy-making, regulation, and legislation.

HEALTH INFORMATION SYSTEMS

This field is designed to provide an understanding of information systems as they are used in the administration of health services. The application of electronic data processing or computers to health care is stressed. Although some knowledge of programming languages will be necessary, the concepts of information and computer systems will be emphasized. Examples of the areas of application are medical records, program evaluation, community/national health statistics, financial management assessment, and productivity control.

HEALTH SERVICES FINANCIAL MANAGEMENT

This field responds to a demand for a thorough understanding by the administrator of financial management in health institutions. The instruction includes managerial accounting, cost analysis, financial decision making, capital formation, and investment analysis, with specific adaptation to unique problems within the health care field.

HEALTH SERVICES MATERIALS MANAGEMENT

This field explores the management of physical resources in health service institutions. The instruction focuses on the purchase and management of

supplies and equipment, inventory management, contracting, cost allocation, plant operations, and facilities maintenance.

HEALTH SERVICES POLICY, MARKETING, AND PLANNING

This field is designed for those who wish to focus on strategic planning and marketing of health care systems and health care institutions and on health policy development and analysis. An emphasis on policy skills will enable the student to develop realistic and accurate statements of principles that can guide the health activities of governments, institutions, and other organizations. An emphasis on planning and marketing skills will enable the student to develop strategies based on values expressed by health services policies and to conduct marketing activities within health services organizations. Skills related to achieving acceptance of policies and implementation of plans will also be developed. The overriding concept is that of strategic health decision making in an atmosphere of systematic inquiry with an awareness of values.

HEALTH SERVICES AND OPERATIONS RESEARCH

This field deals with the application of research techniques and methodologies to the delineation of policy issues and the generation of solutions to problems in the organization, delivery, and financing of health services. Operations research is the application of mathematical techniques such as linear and nonlinear programming, queuing models, and simulation to develop solutions for operating and policy problems.

HUMAN RESOURCES MANAGEMENT

This field covers resources planning, allocation, utilization, and development and evaluation of health services personnel. Included are the various personnel functions, the development of personnel policies and procedures, employee and labor relations, and collective bargaining.

MASTER OF PUBLIC ADMINISTRATION

The Master of Public Administration (M.P.A.) degree program prepares students for professional careers not only in the public service (federal, state, and local) but also in organizations that require a knowledge of public policy and administration, such as public interest groups and research institutes. The 42-semester-hour program, outlined below, is intended to provide both a generic core for all students and specialized elective fields tailored to the interests and career objectives of each individual student. The curriculum provides graduate instruction in all areas recommended by the Guidelines and Standards for Professional Master's Degree Programs issued by the National Association of Schools of Public Affairs and Administration.

All students are required to complete an eight-course (24-semester-hour) core, which includes courses in public administration and management, public expenditure analysis, public policy, organization theory, human behavior in organizations, and research methods; at the end of the program, students are required to take PAd 289, which serves to integrate the diverse perspectives in public administration.

Each student selects, in addition, an elective field designed to provide him or her with deeper and broader knowledge in a field of particular interest. The elective fields generally require a four-course sequence. The program is sufficiently flexible that with the approval of a faculty advisor, the student may

design a special field when none of the fields offered matches individual learning and career objectives.

Students who lack substantial knowledge of the structure and functioning of government are strongly encouraged to take one of two courses in American administrative institutions: PAd 213, Administration in the Federal Government, or PAd 242, Administration of State and Local Governments. The remainder of the program consists of two elective courses chosen by the student with the advisor's approval. The electives may be taken in any related program or discipline.

Because public service requires a wide variety of expertise, students with all undergraduate degree backgrounds are considered for admission. There are no specific course prerequisites.

Required Courses

PUBLIC ADMINISTRATION REQUIRED CORE (24 semester hours)

1. PAd 205 Introduction to Public Administration and Management
2. PAd 295 Research Methods
3. PAd 296 Statistical Applications in Public Administration
4. PAd 261 Policy Analysis in Public Administration **or**
   PAd 260 Policy Formulation and Administration
5. Mgt 210 Individual and Group Dynamics in Organizations
6. PAd 221 Organization Theory and the Public Sector **or**
   PAd 223 Behavioral Factors in Large and Complex Organizations
7. PAd 252 Public Expenditure Analysis and Planning
8. PAd 289 Public Program Management and Policy Implementation

ELECTIVE FIELDS (12 semester hours—see below)

AMERICAN ADMINISTRATIVE INSTITUTIONS (3 semester hours)

Either PAd 213, Administration in the Federal Government, or PAd 242, Administration of State and Local Governments, is recommended as an *introductory* course. In some of the elective fields, either course may be counted as 3 of the 12 required semester hours.

ELECTIVE COURSES (6 semester hours)

Elective Fields

The eight elective fields offered within the Department of Public Administration are described below. Twelve semester hours are required for each field. In addition to the fields listed below, students may elect such other standard four-course fields as Business Economics and Public Policy, Organizational Behavior and Development, Information Systems Management, International Business, and Quantitative Analysis for Decision Making. Students may also take an approved four-course sequence in the Department of Health Services Administration or the Department of Urban and Regional Planning. Moreover, a special field may be constructed, tailored to the student's academic interests and career objectives. To take a special field, the student writes a brief justification, specifying the courses to be taken, and submits it by petition through the faculty advisor.

BUDGET AND PUBLIC FINANCE

This field covers the processes and institutions involved in budgeting, including the practical requirements of financial management; addresses issues of

intergovernmental finance in a federal system; and imparts knowledge of alternative methods for allocating scarce public resources. The field is most directly suited to those who are or envision becoming budget analysts or financial management officers in public agencies.

EXECUTIVE, LEGISLATIVE, AND REGULATORY MANAGEMENT

This field offers the student a broad understanding of some of the major functions critical to effective public management, including personnel, budgeting, and the law. For those entering the M.P.A. program directly from an undergraduate program, this field provides insight into several potential areas for future specialization, employment, or research. For mid-career public officials, this field provides the opportunity to explore more systematically and analytically the governmental functions they have observed in practice.

MANAGING IN PUBLIC ORGANIZATIONS

This field gives primary attention to the managerial processes by which organizations are structured and their work undertaken. It includes courses in organizational theory and large organizations but is also concerned with the management of governmental activities. It is for students who intend careers in management.

MANAGING STATE AND LOCAL GOVERNMENTS

This field is designed for students interested in pursuing careers in state and local government administration. Students learn to deal with a range of federal, state, and local problems and issues, including alternative governmental structures and assignments of functions, sources of revenues and expenditure patterns, intergovernmental relations and management concerns, local government financing, and the formulation and analysis of urban policies.

POLICY ANALYSIS AND EVALUATION

The policy field is designed for those who wish to focus on the processes of public decision making and develop abilities to analyze and evaluate those processes. This field is most directly appropriate for those who now hold or anticipate taking staff analyst positions in government agencies or similar positions in research or consulting firms.

PROCUREMENT AND CONTRACTING

This field covers the many activities of government performed under contractual arrangements. Increasingly, public agencies find the most efficient, and often the only, method of meeting needs is through procurement action. This dimension of public administration is often subject to unique practices and regulations and requires the acquisition of specialized knowledge and skills in the processes of procurement and contracting. This elective field, offered jointly with the Department of Business Administration, promotes a better understanding of public–private interactions in procurement activities.

PUBLIC PERSONNEL ADMINISTRATION AND MANPOWER

This field addresses the traditional concerns in public administration with personnel, the staffing function of public organizations, and labor relations in the public sector. Courses are also offered in manpower development and the use of human resources. Graduates concentrating in this field typically work in personnel administration at some level of government.

TELECOMMUNICATIONS MANAGEMENT

This field is designed for public managers who will find it valuable to understand the various capabilities of telecommunications to organize and utilize information within an organization, to appreciate the policy issues involved in the regulation of telecommunications, and to be conversant with the terminology and structures of telecommunication systems.

Internships

Students with little or no professional experience are strongly encouraged to take an internship during the M.P.A. program. There are many opportunities in the Washington area for intern experiences in federal agencies, county and city government agencies, and the quasi-public sector. The Department assists students in securing appropriate internships; students are also encouraged to find internships on their own initiative. A substantial effort is made to relate the intern experience to the student's academic program. Internships may be paid or unpaid and may be taken for credit or not for credit. To receive academic credit, students must have completed 9 credit hours in the degree program. In general, internships for credit involve 15–20 hours of work per week for 14 weeks.

Also, see Government Intern Scholarship Program under Special Programs, below.

MASTER OF SCIENCE IN INFORMATION SYSTEMS TECHNOLOGY

The Master of Science in Information Systems Technology provides preparation for a career in the application of computers to the data and information problems found in organizations today. The program emphasizes a practical understanding of contemporary design and implementation approaches utilized in the development of computer-based systems.

Degree Requirements

1. Twenty-one semester hours of prerequisite courses or equivalent as follows:
   a. An introductory computer course involving programming (e.g., FORTRAN, BASIC, or PASCAL).
   b. Two additional advanced programming courses covering at least one additional programming language (e.g., PL/1, COBOL, or C). COBOL is strongly suggested as one of the languages.
   c. Two additional advanced undergraduate courses in areas such as assembly language programming, computer systems architecture, data structures, systems analysis, operating systems, data communications, or database systems.
   d. Two semesters of advanced undergraduate mathematics comparable to Math 31 and 32, or 51 and 52.
2. Completion of 30 semester hours of graduate course work with a quality-point index of 3.0, including the following courses plus 6 semester hours of electives: Mgt 280, 281, 282, 283, 284, 285, 286, and 287.
3. Successful completion of a comprehensive examination.

MASTER OF TAXATION

The Master of Taxation degree is designed to prepare students for careers as tax professionals in public accounting, private industry, and government. The program of study provides a thorough understanding of the tax laws and their application. It also supplies the necessary foundation for a broad appreciation of the business environment.

The program consists of 60 semester hours of course work, of which 27 hours may be waived if comparable study has been completed prior to admission. Six semester hours of the minimum program of 33 hours of course work may be awarded as advanced standing.

The program of study consists of two levels.

First Level: Common Body of Knowledge Courses (30 semester hours)

Acct 201, 202, 211, 297; BAd 220, 240; Econ 217; Mgt 205, 218, 270.
These courses must be completed prior to enrollment in Second-Level courses, except Acct 297, which must be taken in the last semester of the program. All of these course requirements, except Acct 297, may be satisfied by evidence of successful completion of comparable work at other regionally accredited institutions. First-Level courses may not be taken to satisfy Second-Level requirements or electives.

Second Level:

1. *Required Courses (21 hours)*

Acct 225, 260, 261, 262, 263, 264, 265

2. *Electives (9 hours)*

Elective courses are to be selected in consultation with the designated faculty advisor.

3. *Required Common Body of Knowledge Course (3 hours)*

This course, Acct 297, is a required capstone course. It must be taken in the last semester.

MASTER OF URBAN AND REGIONAL PLANNING

The program of graduate study in Urban and Regional Planning leads to the professional planning degree of Master of Urban and Regional Planning. It is designed as preparation for careers on the municipal, county, state, and national levels, and for private practice. The course of study is designed to provide a broad education, to develop competence in planning theory and methodology, and to emphasize the analytical ability and creativity necessary for solving urban and regional problems. Each student's program is designed in consultation with an assigned faculty advisor in accordance with individual career plans.

The degree is awarded by vote of the Faculty after satisfactory completion of (1) from 45 to 50 semester hours of course work, depending upon the background and experience of each individual student, including a thesis equivalent to 6 semester hours (most students will ordinarily be required to take 50 semester hours); (2) a minimum of three months' full-time professional training in a planning agency under qualified supervision, with an acceptable written report to be submitted after completion of the training period; (3) a written Master's Comprehensive Examination; and (4) a thesis based on the candidate's research in the field of urban and regional planning.

POST-MASTER'S GRADUATE CERTIFICATE IN HEALTH SERVICES ADMINISTRATION

Students with a master's degree in an approved related field or with a master's degree and managerial experience may undertake studies leading to the Post-Master's Graduate Certificate in Health Services Administration. This program serves people who plan to begin a career in management, policy-making, or planning in the field of health services or who wish to supplement previous graduate study in health services administration.

Most students with adequate preparation in health services administration or a related management field should be able to complete the requirements by

undertaking a 30-semester-hour program of study. Those lacking specialized preparation will need additional course work, depending on career goals. Field experience assignments, if required, are in addition to the 30-semester-hour minimum.

Individual programs will be developed in consultation with a faculty advisor on the basis of the student's educational background, experience, and specific professional objectives.

All students must take at least one doctoral-level seminar in health services administration (HSA 310 or 330) and complete a 3-semester-hour research project (HSA 270). The remaining hours may be taken in health services administration or other appropriate disciplines.

DOCTORAL PROGRAMS

Study for the degree of Doctor of Business Administration (D.B.A.) and Doctor of Public Administration (D.P.A.) is supervised by the Committee on Doctoral Studies.

Admission

The minimum admission requirement is a bachelor's degree from a regionally accredited college or university, preferably with a major appropriate to the proposed field of study. Applicants whose degrees are in fields other than business or public administration are expected to obtain the necessary background either before or soon after admission to the program. Scores on the Graduate Record Examination or the Graduate Management Admission Test are required. However, applicants who have taken the Law School Admission Test or the Medical College Admission Test may submit these test scores for consideration. Under special circumstances, scores on the Miller Analogies Test may also be submitted. Applicants whose test scores are more than 10 years old are required to take or retake the Graduate Record Examination or the Graduate Management Admission Test. Applicants whose test scores are more than five years old are encouraged but not required to take or retake either of the tests. Arrangements to take the tests must be made with the Educational Testing Service. Students whose native tongue is not English must also submit the Test of English as a Foreign Language (TOEFL) scores with a total score of at least 550.

The Doctoral Committee does not use specific cutoff points for grade averages and test scores. It carefully reviews each applicant's entire record and makes its selection on a competitive basis in keeping with enrollment limitations.

This evaluation takes three to four weeks, after which the Office of Enrollment Development and Admissions notifies each applicant, through the mail, of the Committee's decision. Completed applications must be sent to the Office of Enrollment Development and Admissions, School of Government and Business Administration, George Washington University, Washington, D.C. 20052, by March 1 for the fall semester and summer sessions and by October 1 for the spring semester. Graduates of non-U.S. universities must apply by February 1 for the fall semester and summer sessions and by September 1 for the spring semester.

Plan of Study

The doctoral programs in both Business Administration and Public Administration consist of two major parts: the pre-dissertation stage and the dissertation

stage. The objective of the pre-dissertation stage is to provide the student with the theoretical foundations and practices of the major and supporting fields of study and with a command of the relevant qualitative or quantitative analytical methods. The objective of the dissertation stage is to have the student apply the obtained theoretical and practical knowledge and analytical methods to the resolution of a research problem. The research should be original and is expected to result in a contribution to the existing body of knowledge on business administration or public administration. Such a contribution can be either applied or theoretical. The total program must be finished in seven years; extensions beyond this time limit can be given by the Committee on Doctoral Studies only under very special circumstances.

The pre-dissertation stage is based on an individual study plan developed by the student under the guidance of the major and supporting field advisors during the first academic year. In the study plan the student must state long-range professional objectives, all proposed academic activities, methods of evaluation, and a semester-by-semester schedule.

All students, regardless of the degree they seek and of the major field of study, must include in their study plan Mgt 390, Philosophical Foundations of Administrative Research, and the multidepartmental course, 311–12, Seminar: Public–Private Sector Institutions and Relationships. These courses should be taken during the first academic year after admission.

In addition to the evaluation methods proposed in the study plan, the major and supporting field advisors are expected to evaluate the student's progress at the end of the first and second semesters after admission, and thereafter before the end of the spring semester of each academic year.

Major and supporting fields of study include:

- Accountancy
- Business Economics and Public Policy
- Finance and Investment
- General Management Systems
- Health Services Administration
- Information Systems Technology
- International Business
- Management of Science, Technology, and Innovation
- Marketing
- Materials and Operations Management
- Organizational Behavior and Development
- Personnel Management
- Public Administration
- Quantitative Analysis for Decision Making
- Urban and Regional Planning*

A student seeking a D.P.A. degree is required to take public administration at least as a supporting field, to include in the study plan three doctoral-level courses in public administration, and to engage in activities as specified by the field advisor.

While the major field of study must be selected from the above list, supporting fields can be chosen from other departments of the University. A student selecting a field outside of the School, however, must meet the academic and administrative requirements of the department involved.

For more detailed information on the program and its administration, see the *Handbook of the Doctoral Programs in Business Administration and Public Administration*, available in the Doctoral Programs Office.

* Can be selected only as a supporting field.

SPECIAL PROGRAMS

Government Intern Scholarship Program

The Government Intern Scholarship Program offers annually 50 scholarships to assist government agencies in educating carefully selected young men and women for administrative leadership in government career service. Interns who do not already hold a master's degree may be eligible for a scholarship that provides full tuition for two 3-hour courses in one semester, and interns who maintain satisfactory standing in their government employment and a 3.0 average in their academic program may qualify for a second scholarship in a later semester.

Continuing Education in Health Services Administration

A nondegree program is conducted, both on and off campus, in the various areas of health services administration whenever a sufficiently large class is organized. Institutes, workshops, and lecture series are conducted under the auspices of program faculty and selected leaders from local, state, and regional areas on topics of current interest to the requesting organization. There is no specific prerequisite. Fees are to be announced.

International Institute for Health Services Administration

In recognition of special educational needs of students from other countries, the International Institute for Health Services Administration offers programs of instruction designed to meet these needs at either the degree or certificate level.

It is also equipped to enter into arrangements with principals of hospital systems in worldwide areas to assist in the preparation of teaching programs or the actual instruction of administrative personnel either abroad or at the University.

Combined Master's and Juris Doctor Degree Program

In certain instances arrangements may be made for students to work concurrently toward both the Juris Doctor degree in the National Law Center and a master's degree in some fields in the School of Government and Business Administration. Students must apply separately and be admitted to both the National Law Center and to the School of Government and Business Administration and must meet all requirements in each degree program. It is possible for a student to complete work for both degree programs within four years.

Certification of Purchasing Managers

The School of Government and Business Administration participates in the three nationally recognized certification programs.

Certified Public Purchasing Officer (CPPO)
Administered by:
National Institute of Governmental Purchasing
115 Hillwood Ave.
Falls Church, Va. 22046

Certified Professional Contracts Manager (CPCM)
Administered by:
National Contract Management Association
6728 Old McLean Village Dr.
McLean, Va. 22101

Certified Purchasing Manager (CPM)
Administered by:
National Association of Purchasing Management
496 Kinderkamack Rd.
P.O. Box 418
Oradell, N.J. 07649

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C.F. Elliott (*Chairman*), M.A. Atkin, A. Gyorgy, C.A. Linden, C.A. Moser, G.A. Olkhovsky, J. Pelzman, M.J. Sodaro, R. Thornton, S.L. Wolchik

COMMITTEE ON SECURITY POLICY STUDIES

W.H. Lewis (*Chairman*), C.J. Deering, C.F. Elliott, B. Nimer, R.W. Rycroft, B.M. Sapin, M. Sodaro, G. Stambuk

INTRODUCTION

With the establishment in 1898 of the School of Comparative Jurisprudence and Diplomacy, the study of government was first organized as a separate entity in the University. In 1928, this School was reorganized and broadened as the School of Government. During the next two decades, programs in business administration and public administration were added, and the emphasis gradually shifted from undergraduate to graduate study. The name was changed in 1960 to the School of Government, Business, and International Affairs to reflect more accurately the offerings of the School. A division of the School was effected in 1966, and two schools were established—the School of Government and Business Administration, a primarily professionally oriented school, and the School of Public and International Affairs, a primarily policy-oriented school.

Programs of the School of Public and International Affairs are interdisciplinary and emphasize both domestic and foreign governmental policy. The School itself offers no courses but draws upon the course offerings of the various academic departments of the University.

Students in the freshman and sophomore years are registered in Columbian College of Arts and Sciences, the liberal arts college of the University, and are assigned special advisors from the School of Public and International Affairs to assist them in planning their programs.

Academic Programs

The School of Public and International Affairs offers undergraduate and graduate programs in International Affairs, Middle Eastern Studies, and Public Affairs; undergraduate programs in Chinese Language and Literature, East Asian Studies (China or Japan), and Urban Affairs; and graduate programs in East Asian Studies, Latin American Studies, Russian and East European Studies, Security Policy Studies, and Science, Technology, and Public Policy.

Special programs in Soviet, Far Eastern, and East European Studies are offered by the School's Institute for Sino-Soviet Studies.

Objectives

Five undergraduate programs of study—International Affairs, East Asian Studies, Middle Eastern Studies, Public Affairs, and Urban Affairs—are aimed at preparing the student to understand major contemporary issues in international affairs or in domestic public affairs. The programs are designed not to produce narrow professional specialists, but to foster a liberal education, interdisciplinary in nature and broader than a concentration in one of the conventional disciplines. Each program has a two-fold purpose: to develop a background as broad and as deep as possible in order to assist in the understanding and analysis of modern problems and to give instruction in some useful tools of analysis. The program in Chinese Language and Literature is closer to the traditional liberal arts pattern, emphasizing language and culture.

The graduate programs leading to the degree of Master of Arts are more concentrated. The student is expected to develop a greater competence in an area or a discipline, building on the student's undergraduate program in preparation for professional employment in government, international organizations, business, or private agencies concerned with public or international affairs.

REGULATIONS

See Admissions, Registration, Fees and Financial Regulations, and Regulations.

Attendance

Students may not attend classes until registration is completed and fees due are paid.

Students are held responsible for all of the work of the courses in which registered, and all absences must be excused by the instructor before provision is made to make up the work missed.

A student suspended for any cause may not attend classes during the period of suspension.

Withdrawal

Withdrawal after the end of the fifth week of classes (fall or spring semester without academic penalty is permitted only in exceptional cases (see Withdrawal, under Regulations).

THE DEGREE OF BACHELOR OF ARTS

The School offers programs leading to the degree of Bachelor of Arts in the fields of International Affairs, Chinese Language and Literature, East Asian Studies (China or Japan), Middle Eastern Studies, Public Affairs, and Urban Affairs.

ENTRANCE REQUIREMENTS

The satisfactory completion of the International Affairs, Chinese Language and Literature, East Asian Studies, Public Affairs, or Urban Affairs curriculum in

Columbian College of Arts and Sciences (see pages 74–76), or the equivalent, is required.

GENERAL REQUIREMENTS FOR THE DEGREE

The following requirements apply to both the standard 120-semester-hour and the special 90-semester-hour programs. See page 165 for additional requirements for the 90-semester-hour program.

Academic Work Load

Normal academic work load for the full-time student is 15 semester hours. A student with a strong academic record may take up to 18 semester hours with the approval of the dean.

Scholarship Requirements

In order to graduate, a student must have the following: (1) 120 semester hours (or 90 semester hours if the student qualifies for the special 90-semester-hour program) of passing grades (courses in human kinetics and leisure studies cannot be included in the required hours); and (2) grades of *A* or *B* in four 3-semester-hour courses in the major, to be taken in residence at George Washington University. The major includes the required second-group courses (101–200) and courses taken in the group options.

DEAN'S HONOR LIST

The name of every student who attains a 3.50 quality-point index* in course work is placed on the Dean's Honor List for that semester. Appearance on the list will be limited to (1) full-time students registered for a minimum of 12 semester hours and (2) part-time students registered for a minimum of 12 semester hours over a period of two consecutive semesters, which may include a summer term.

ACADEMIC STANDING

A student who is not suspended or on probation is considered to be in good standing.

The rules below govern probation and suspension and are applicable as stated to students enrolled for a full-time program (12 semester hours or more) during the fall or spring semester or the three summer sessions. For students taking fewer than 12 semester hours in any one semester or summer session, these rules are applied on the basis of 12 or more hours taken during two or more semesters or summer sessions.

Probation—Students who in one semester receive two grades of *F*† in courses carrying 3 or more semester hours of credit each, or the equivalent, are placed on probation. Those on probation who receive one grade of *F* in such a course will be continued on probation for a second semester. Those on probation who are taking 12 or more semester hours and whose grades are all *C* or better are removed from probation.

Suspension—The following three cases constitute grounds for suspension: (1) three grades of *F*† in courses carrying 3 or more semester hours of credit or

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* See page 46 for explanation of the quality-point index.

† In determining whether a student is placed on probation or suspension, two grades of *D* are equated with one grade of *F*. Thus, for example, a student who receives one grade of *F* and two grades of *D* is placed on probation, and a student who receives two grades of *F* and two grades of *D* is suspended.

the equivalent; (2) two grades of *F* when on probation; (3) one grade of *F* when in a second semester of probation. Students who are suspended for poor scholarship may apply for readmission after the lapse of one fall or spring semester. To be considered for readmission, the student must submit evidence to the Dean's Council of conduct during absence from the University that indicates that the student will profit from readmission. Students readmitted after suspension are on probation. Those who are still on probation after completing 24 credit hours will be suspended. A student suspended twice for poor scholarship will not be readmitted.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described under Regulations.

Removing an Incomplete—The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An Incomplete that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here or by taking its equivalent elsewhere.

Residence

A minimum of 30 semester hours, including at least 12 hours in the major field, must be completed while registered in the School of Public and International Affairs. This requirement applies to students transferring within the University as well as to students transferring from other institutions. Unless special permission is granted by the dean to pursue work elsewhere, the work of the senior or final year must be completed in the School of Public and International Affairs.

Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the dean. The dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up any such deficiency in English to the satisfaction of the dean.

Study Abroad

Students wishing to study abroad must consult their advisor and the dean (arrangements are made on an individual basis). Students must secure the dean's prior approval for any plan of study abroad if the credit so earned is intended to apply to the degree program in which they are registered. A catalogue or other description of the foreign institution or study program must be presented for consideration together with detailed descriptions of the courses to be taken. Students of international affairs are encouraged to travel and study abroad.

Pass/No Pass Option

A student in the School of Public and International Affairs who has a cumulative quality-point index of 2.5 or better may, with the approval of the

advisor and the dean, take one course each semester and receive a grade of *P*, Pass, or *NP*, No Pass, which will be recorded on the student's transcript but will not be reflected in the cumulative grade average. A student must sign up for such an option at registration. Under no circumstances may a student change from pass no pass status to graded status, or vice versa, after the end of registration. Courses in the student's major (except those in which the grade of *P* or *NP* is normally assigned) may not be taken on a pass/no pass basis. A transfer student may not elect to take a course on a pass/no pass basis until the second semester of enrollment in the University. Students in the School of Public and International Affairs may take no more than six courses in which the grade of *P* or *NP* is assigned, including those in which the grade of *P* or *NP* is normally given and those taken in any other college, school, or division of the University prior to transferring to the School of Public and International Affairs.

Additional Requirements for the 90-Semester-Hour Program

Exceptional students may, when registered as freshmen or sophomores in Columbian College of Arts and Sciences, petition the dean of the School of Public and International Affairs for admission to a special 90-semester-hour degree program in the School of Public and International Affairs. Supporting evidence in the form of achievement test scores, College-Level Examination Placement (CLEP) scores, and grades earned at George Washington University or any other institution must be supplied. The dean, in consultation with the Dean's Council, will determine eligibility for admission to the program, which takes place when the student enters the School of Public and International Affairs at the beginning of the junior year.

The basic assumption of this program is that the student can waive at least 30 semester hours of freshman or introductory requirements.

In addition to the general and curriculum requirements, students in the 90-semester-hour program must fulfill the following requirements:

1. The student must receive grades of *A* in 50 percent of the total course work and in 50 percent of the courses required in the major.
2. The student must take at least 60 semester hours in courses beyond the first-group level (numbered above 100).
3. The 90 semester hours of credit must be earned in actual course work, i.e., credit through advanced placement, special examinations, etc., may not be counted in the 90 semester hours required for graduation.

Students who qualify for admission to the 90-semester-hour program are encouraged to begin taking second-group courses (numbered 101-200) as soon as they are qualified to do so and should seek to obtain a waiver of course prerequisites in those disciplines in which they have a strong background.

CURRICULUM REQUIREMENTS

To be recommended by the faculty for graduation, candidates are required to complete, in addition to the appropriate freshman and sophomore work (see Columbian College of Arts and Sciences), a minimum of 60 semester hours during the junior and senior years, as set forth in one of the following curricula.

Earning Credit or Waiving Requirements by Examination

For information on earning credit by examination or waiving curriculum requirements, see the chairmen of the individual academic departments.

Degree Programs

Requirements for the six programs of study leading to the degree of Bachelor of Arts are listed below. Students should consult the appropriate department in the Courses of Instruction section of this *Bulletin* for complete course descriptions. The prerequisite curriculums for the freshman and sophomore years for each of the programs are listed on pages 74–76, under Columbian College.

INTERNATIONAL AFFAIRS

The major in International Affairs enables the student to specialize in international politics, international economics, international communications, or regional studies.

Requirements for the Major—(1) Econ 181–82, (2) 6 semester hours of a third year of foreign language (may be literature courses taught in the language), (3) 3 semester hours selected from Geog 2, 127, 132, 133, 134, 135, 145, 146, 154, or 161, (4) Hist 182 and one course selected from Hist 136, 150, or 157, (5) PSc 140 and 142 or 144, (6) 15 semester hours from one of the group options listed below:

Group I International politics—courses concerned with theory and practice in international affairs, forces shaping the world scene, and American foreign policy, selected from Geog 127, 133, 134, 139, 146 (if not elected to satisfy the major requirement), Hist 137, 139–40, 149, PSc 105–6, 107, 108, 130, 131, 146, 149, 161, 178, 182, 183, 184, 186, 191, 192 (PSc 142 or 144 may be elected if not taken to satisfy the major requirement)

Group II International economics—courses concerned with the world economy and American policy and practice in international trade and finance, selected from BAd 160, 166, 173, Econ 101, 102, 104, 121, 122, 134, 147, 151, Geog 125, 127, 133, 134, 135, Stat 111, 112

Group III International communications—courses concerned with the study of international information programs, public opinion, psychological warfare, cultural relations, and public relations, selected from Anth 150, 153, 157, 161, 162, 168, Geog 106, 125, Jour 145, 146, Jour/PSc 128, PSc 120, 129, 146, Psyc 115, 151, 156.

Group IV Regional study—a concentration in one of the following areas: (1) Africa—courses selected from Anth 178, Hist 116, PSc 180, 181, 182, (2) Europe—courses selected from Econ 147, Hist 128–29, 131–32, 141–42, 147, 149, 151–52, 158, PSc 105–6, 130, 131, 161, (3) Far East—courses selected from Anth 173, 175, Chin 163–64, 181, 182, Econ 169, Geog 266, Hist 137, 187, 188, 195–96, PSc 105, 170, 173, (4) Latin America—courses selected from Anth 170, 172, 185, Econ 185, Geog 161, Hist 162, 163–64, 165, PSc 183, 184, interdisciplinary seminar 287 (PSc 285) offered by six departments participating in the Latin American Studies program, (5) Middle East—courses selected from Anth 177, Geog 154, Hist 158, 193, 194, PSc 177, 178, 179, 180, Rel 161, or (6) Soviet Union and Eastern Europe—courses selected from Econ 133, 134, Geog 265, Hist 137, 143, 145, 146, 188, PSc 108, 131 or 165, 168, Slav 161–62, 165, 166

CHINESE LANGUAGE AND LITERATURE

Requirements for the Major—Chin 11–12, 109–10, and 163–64, plus 12 additional semester hours of second-group Chinese literature courses. The student is required to pass a major examination at the end of the senior year. The coordinated field of knowledge upon which the student will be examined includes an active command of modern Chinese language and a general knowledge of Chinese literature and culture. A proseminar (Chin 199–200) assists the student in preparation for the major examination.

Students in the Chinese language and literature program may study abroad in the junior year.

EAST ASIAN STUDIES (China or Japan)

The major in East Asian Studies is designed to introduce the student to a non-Western culture and to provide an understanding of the history, politics, and

economy of modern China or Japan. The major is interdepartmental and is recommended for students who wish a comprehensive study of one of the world's major civilizations and for those who contemplate graduate study in Chinese, Japanese, or Far Eastern affairs.

A junior year abroad is available in this program of study for those interested in China. Students should contact the chairman of the Department of East Asian Languages and Literatures.

Requirements for the Major—(1) Chin 11 (China focus) or minimum of 3 additional hours of Japanese (Japan focus), and Chin 163 or 164; (2) Econ 169 (China focus) or 170 (Japan focus); (3) 3 semester hours selected from Geog 2, 127, 132, 133, 134, 146, or 266; (4) 9 hours selected from Hist 137, 187, 188, 189, 195, 196 (either Hist 187 or 196, but not both, may be selected); selection covering both pre-modern and modern periods encouraged; (5) PSc 170 or 173; (6) 9 semester hours of course work in economics, history, or political science not related to China or Japan, to be selected in consultation with and approved by the advisor; (7) 6 semester hours of research and writing seminar related to China or Japan and taken in discipline of concentration.

MIDDLE EASTERN STUDIES

The major in Middle Eastern Studies introduces the student to this region through interdepartmental studies.

Requirements for the Major—(1) 6 semester hours of a third year of a modern foreign language; (2) 3 hours of either religion, art, philosophy, or literature of the Middle East; (3) 3 semester hours selected from Geog 125, 127, 132, 145, 146, or 154; (4) 6 semester hours selected from Hist 107, 108, 109, 110, 158, 193, or 194; (5) 6 semester hours selected from PSc 177, 178, 179, or 180; (6) 6 semester hours selected from Econ 136, 181, or 182; (7) 9 semester hours of course work in economics, history, or political science not related to the Middle East, to be selected in consultation with and approved by the advisor; (8) 6 semester hours of research and writing seminar related to the Middle East and taken in the discipline of concentration.

PUBLIC AFFAIRS

The major in Public Affairs deals with domestic government and policy.

Requirements for the Major—(1) Econ 101, 161, 162; (2) Hist 133 and 134, 171–72, or 175–76; (3) PSc 114 or 115, 116 or 117, 119; (4) 12 semester hours from one of the group options listed below.

Group I. Economics—courses selected from Econ 102, 104, 121, 122, 123, 136, 142, 159, 165, 181–82; Geog 2.

Group II. Politics—courses selected from PSc 106, 110, 111, 112, 116 (if not taken as a major requirement), 117, 118, 120, 122, 124, 130, 146.

Group III. Urban affairs—courses selected from AmCv 177 or AmCv/Hist 186; Econ 157; Geog 124, 140, 141, 142; PSc 111, 112; Soc 126; U&RP 153, 154.

URBAN AFFAIRS

The Urban Affairs program is designed for undergraduates interested in urban-related occupations, in furthering their knowledge about theories and findings related to urban life, or in acquiring the tools that will help them to apply themselves effectively to the task of devising solutions to the problems that cities and their residents face. The program consists of a focused set of courses that introduces the student to the problems and issues of urban America from the perspectives of various social science disciplines.

The central focus of the program is on urban public policy—the various forces that shape it and its adequacy relative to current and anticipated needs. Within the overall framework, students can specialize in either the political and social, economic and financial, design, or research methodological aspects

of urban studies. In the senior year, each student serves an internship in an urban-related agency or research organization and attends a weekly seminar restricted to urban affairs majors. Each student is encouraged to work closely with the urban affairs advisor to develop a program tailored to personal interests and goals.

Requirements for the Major—(1) Urban Affairs core courses: Econ 157; Geog 140; Hist 186, PSc 101, 111, 112, and one course chosen from among Stat 51, 53, or 111. (2) Special Urban Affairs fields: each student will be required to take four courses from within one of the following four fields of specialization, and two courses from each of the others. Field A—Urban Research Methods: Geog 104, 106; Stat 51, 53, or 111; Stat 105, 107, 112, 119, 123. Field B—Political and Social Urban Analysis: PSc 104, 111, 124; Soc 126, 128; PAd 125. Field C—Urban Economics and Financial Analysis: Econ 101, 121, 136, 161, 162, 165; BAd 132. Field D—Urban Design and Spatial Analysis: AmCv 177; Geog 124, 141, 142, 143; U&RP 153, 154. (3) Senior Internship and Seminar: PSc 188 and 193—the grade of *P* (Pass) or *NP* (No Pass) will be given for PSc 188. A student may elect to fulfill the internship requirement in a paid position in lieu of registering for PSc 188; however, the student must substitute 6 semester hours of elective course work.

THE DEGREE OF MASTER OF ARTS

The School offers degree programs leading to the Master of Arts in the fields of East Asian Studies, International Affairs, Latin American Studies, Middle Eastern Studies, Public Affairs, Russian and East European Studies, Security Policy Studies, and Science, Technology, and Public Policy.

ADMISSION REQUIREMENTS

Application forms are available from the Office of Graduate Admissions, School of Public and International Affairs, George Washington University, Washington, D.C. 20052.

A bachelor's degree from an accredited college or university, with a *B* average or better, or the equivalent, in the relevant undergraduate major is normally required. If there is evidence of special promise, such as high Graduate Record Examination scores, an applicant whose academic record falls short of *B* will be given serious consideration. Scores on the General Test of the Graduate Record Examination as well as letters of recommendation are required.

In International Affairs—The applicant's undergraduate program should include background courses corresponding to the interdepartmental undergraduate major in international affairs at this University or some other relevant social science program. In the case of major deficiencies in the social sciences or international relations, additional course work may be specified beyond the minimum requirements for the master's degree. The student's particular responsibilities will be indicated in the letter of admission to the program and in the course of subsequent consultation with an assigned faculty advisor.

In East Asian Studies—An undergraduate major in a pertinent field is required. For the concentration in Chinese language and literature, the undergraduate program should include 24 semester hours of Chinese language study.

In Latin American Studies—The applicant's undergraduate program should include background courses corresponding to an undergraduate major in Latin American Studies at this University, or equivalent. Majors in other fields may be considered for admission provided that undergraduate course work includes Spanish or Portuguese and sufficient course work in one of the following areas: anthropology, economics, geography and regional science, Hispanic literature, history, and political science.

In Middle Eastern Studies—The applicant's undergraduate program should include background courses corresponding to an undergraduate major in Middle Eastern Studies at this University, or equivalent.

In Public Affairs—An undergraduate major in public affairs, economics, history, or political science, depending upon the field of specialization in the master's program, is required. Students entering the program are assumed to have had some college-level course work in American government and politics, American history, and economic theory. To the extent that a student lacks such a background, the student must, in consultation with an advisor, undertake the appropriate remedial course work, including some courses that may be taken for graduate credit.

In Russian and East European Studies—An undergraduate major in a pertinent field is required. The undergraduate program should include the following courses, or equivalent: Hist 145, 146; PSc 131 or 168; Slav 1–2 and 3–4, or 5–6.

In Science, Technology, and Public Policy—Undergraduate majors in a social, life, or physical science, or in engineering are eligible for admission, although those lacking adequate preparation in relevant social sciences, particularly economics, may be required to take additional courses; such requirements will be indicated in the letter of admission to the program.

In Security Policy Studies—An undergraduate background similar to that specified above for International Affairs would be appropriate. Working experience in the military or national security fields might compensate in part for inadequate academic preparation. A background in economics or quantitative analysis skills would also be helpful.

Readmission

A graduate student who has not been continuously enrolled, or on approved leave of absence or inactive status, must file an application for readmission the semester before planning to return to school. Applications for readmission are reviewed by the dean and the Committee on Admission.

GENERAL REQUIREMENTS

There are two options available in all programs leading to the Master of Arts degree except Security Policy Studies, in which only the nonthesis option is available, and East Asian Studies (with a concentration in Chinese language and literature), in which only the thesis option is available. One option requires a minimum of 24 semester hours of approved graduate work plus the successful completion of a thesis; the student must register for 6 semester hours of Thesis Research (299–300). The second option requires a minimum of 36 semester hours of graduate course work and does not include a thesis. The course work for both options is taken in preparation for the Master's Comprehensive Examination.

Candidates for the degree of Master of Arts are required to submit an advisor-approved Program of Studies (comprehensive fields, supporting course work, tool requirement, etc.) to the office of the dean by the end of the first semester in residence.

Master's degrees are awarded by vote of the Faculty after the student has completed the required course work and an acceptable thesis (if one is elected), has satisfied the foreign language or tool requirement, and has passed the Master's Comprehensive Examination.

Under special circumstances second-group courses (numbered 101–200) may be counted toward the master's degree when registration for graduate

credit has been approved at the beginning of the course by the curriculum advisor, the instructor, and the dean. The student who takes an undergraduate course for graduate credit is expected, by arrangement with the instructor, to do work at the graduate level in addition to the regular work of the course. Normally, no more than 6 semester hours of second-group courses may be taken for graduate credit in the 30-semester-hour program, and no more than 9 semester hours may be taken for graduate credit in the 36-semester-hour program. (The one exception to this rule is the case of students who select one or more fields in history; they may take 9 hours of second-group courses in the 30-hour program and 12 in the 36-hour program.) No work counted toward a bachelor's degree may also be counted toward a master's degree.

All master's degree candidates must complete degree requirements within five years of their admission to the program. A student who is unable temporarily to continue the program of studies may request a leave of absence not to exceed one year. Extensions beyond the five-year period may be granted in exceptional circumstances, but the student will be required to register and pay for 6 credit hours of Reading and Research each semester.

No credit is granted for work done in absentia or without formal instruction, except for the thesis, which may be completed in absentia with the permission of the curriculum advisor and the dean. No more than 6 semester hours of graduate credit may be transferred from other accredited institutions or another division of the University, and these may be accepted only under limited conditions of time, grades, and relevance to the student's program.

Tool Requirements

In most programs of study, a candidate for the degree of Master of Arts must demonstrate a reading knowledge (certified by the appropriate language department) of at least one modern foreign language, to be approved by the dean. A master's degree candidate whose native language is not English may not select the native language to meet the tool requirement; the candidate may select English to fulfill the requirement with the approval of the advisor and the dean. The examination, which will test high-level reading and writing proficiency, is administered by the English for International Students program.

Candidates in the fields of Public Affairs, Security Policy Studies, and Science, Technology, and Public Policy may substitute statistics for a foreign language. This requirement may be met by demonstration of proficiency (i.e., grades of *B* or better) at the level of Stat 105, 112, 183, or 197.

Candidates in International Affairs may petition the dean to substitute statistics for a foreign language. The primary basis for approving such petitions will be the relevance of the statistical skills to the student's thesis research.

The language or tool examination should normally be taken before the student has completed the first 15 hours of work; it must be taken before the comprehensive examination. No student may take the language or tool examination more than three times.

Courses taken to fulfill the tool requirement are not counted in the semester-hour requirement for a master's degree, nor may they be taken on a Pass/No Pass basis.

Master's Comprehensive Examination

In addition to any course examinations, the candidate must pass a written Master's Comprehensive Examination. Examinations are scheduled twice a year (usually in November and April) and should be taken during the last

semester of course registration or shortly after the completion of the prescribed course work. If there is a lapse of time between completion of course work and the examination, the student must be enrolled continuously during this period. The candidate must consult with the advisor well in advance concerning the date of the examination and the definition of the subject-matter fields that this examination is to cover. It should be understood, however, that course work constitutes only partial preparation for the Master's Comprehensive Examination. Each student is also expected to pursue a program of additional reading in each of the selected fields, in accordance with the advice of the faculty member responsible for instruction in that field. An oral examination on the thesis or major report may also be required.

Scholarship Requirements

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *CR*, Credit; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; and *Z*, Unauthorized Withdrawal.

An average of *B* or better is required for the master's degree. The grade of *C* is not considered as failing but must be counterbalanced by a grade of *A* in a graduate course of equal status.

A master's candidate who receives a grade of F is required to present cause for consideration by the Dean's Council as to why he or she should be allowed to continue in the program of studies.

Whenever a grade has not been assigned, the symbol *I* (Incomplete) or *W* (Authorized Withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given to the instructor for the student's failure to complete the required work of the course. Except for thesis research courses, an Incomplete cannot be made up after the lapse of one calendar year. An Incomplete that is not removed by the end of one calendar year remains as a grade of *I* on the student's record. An Incomplete cannot be removed by reregistering for the course. No student will be permitted to register for courses or take the Comprehensive Examinations if there are more than two Incompletes outstanding on the record.

A student who fails to meet the established deadlines for completion of course work or other elements of the program (e.g., comprehensive examinations) and is granted an extension may be required by the dean and the Dean's Council to register for 3 credit hours of graduate Reading and Research for each semester that the work is delinquent.

The Thesis

The thesis subject should be selected as early as possible so as to permit effective integration with the course work. A student will not be permitted to register for Thesis Research (299–300) until the thesis subject has been formally submitted to the Dean's Office. The subject must be approved by the student's advisor and the member of the Faculty under whom the thesis is to be written. The thesis in its final form must have the approval of the thesis director and one other reader, and two copies must be presented to the dean by the student no later than the date announced in the University Calendar. Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Dean's Office.

Payment of tuition for the thesis entitles the candidate, during the period of registration, to the advice and direction of the thesis director and the other reader. In case a thesis is unfinished, the student must maintain continuous

enrollment and is allowed one calendar year to complete it. If the preparation of the thesis extends beyond the additional calendar year, the student must register for the entire 6 hours of thesis again and pay tuition as for a repeated course.

Degree Programs

Specific requirements for each of the eight degree programs leading to the Master of Arts are listed below. For prerequisites, see Admission Requirements, above.

INTERNATIONAL AFFAIRS

The interdisciplinary program leading to the degree of Master of Arts in the field of International Affairs provides the student with a wide choice of fields within three broad areas of study: general, supplemental or special, and regional. Graduate courses in anthropology, business administration, economics, geography and regional science, history, political science, psychology, and sociology are related to these fields, listed below:

General Fields of Study—International politics, comparative government and politics, modern political theory (including socialist and communist theory), and international economics.

Supplementary or Special Fields—International law; international organization and administration; international economic development; international and comparative aspects of communism; U.S. diplomatic history; U.S. foreign policy; science, technology, and public policy; 20th-century British defense and foreign policy; and U.S. national security policy.

Regional Fields—Modern history, or government and politics, or economic history and problems of one of the following: Western Europe, Eastern Europe, the Soviet Union, Latin America, the Middle East, Africa, South and Southeast Asia, Japan, and China. Within each geographical area there are normally three fields of study available.

Each degree candidate must select at least one general field. The fields should also represent at least two disciplines. Beyond these limits, the student is free to select any of the fields indicated above as long as they comprise a coherent program. Courses should be chosen with a view to their relevance to the selected fields. Candidates will be examined on their selected fields of study in the Master's Comprehensive Examination.

Candidates who elect to write a thesis must choose three of the listed fields and take, in addition to the thesis, a minimum of 24 semester hours of graduate course work in at least two departments, with no more than 15 hours in any one department.

Candidates electing a program without a thesis must choose four fields and may take no more than 21 of their required 36 semester hours in one department. They must also include in their program at least two research seminars (6 semester hours) requiring the preparation of substantial research papers.

EAST ASIAN STUDIES

The Master of Arts in the field of East Asian Studies is an interdisciplinary program that includes course work from at least four of the following disciplines: Chinese language and literature, economics, geography, history, and political science.

The degree program consists of 30 semester hours of course work, including 6 hours of thesis research, or 36 semester hours of course work without a thesis.

Candidates electing the 36-semester-hour option must prepare a substantial research paper in a two-semester readings/research course. All candidates must pass a Master's Comprehensive Examination in one major and one or two minor fields. To fulfill the tool requirement candidates must demonstrate proficiency in either Chinese or Japanese language; with the permission of the dean, another East Asian language may be substituted. (As preparation for this requirement, a special Chinese language course will be available to students in the program.)

Only the 30-semester-hour thesis option is available to students selecting a concentration in Chinese language and literature. That program includes 12 semester hours of Chinese language and literature, 6 hours of history, 6 hours of electives selected in consultation with the advisor, and 6 hours of thesis research.

LATIN AMERICAN STUDIES

The program leading to the degree of Master of Arts in the field of Latin American Studies is designed to provide the student with an appropriate area background in three or four of the following fields: anthropology, economics, geography and regional science, Hispanic literature, history, and political science.

All degree candidates must complete 12 semester hours of graduate work, including the interdisciplinary seminar (287), in a major field selected from those listed above and 6 semester hours in each of two minor fields selected from those listed above. Students who elect not to write a thesis, must take 6 semester hours in a third minor field selected from those listed above or from the fields of urban and regional planning; population studies; international business; science, technology, and public policy; tourism development and travel administration; and women's studies. The student must also complete an additional 6 semester hours in any of the major or minor fields selected. The tool requirement must be satisfied by demonstration of proficiency in Spanish or Portuguese, or in English if the student's native language is Spanish or Portuguese. The Master's Comprehensive Examination will cover all of the student's selected fields.

MIDDLE EASTERN STUDIES

The interdisciplinary program leading to the degree of Master of Arts in the field of Middle Eastern Studies offers the student an appropriate area background in three or four of the following fields: domestic politics, international relations, history, economics, geography and regional science, anthropology, religion, philosophy, art, and literature. One approved field from the international affairs curriculum may also be included.

The degree program consists of 30 semester hours of course work, including 6 hours of thesis research, or 36 semester hours of course work without a thesis (the latter option requires preparation of a substantial research paper in a two-semester readings research course). In the 30-hour program, students select one major and two minor fields; in the 36-hour program, students choose one major and three minor fields. Written Master's Comprehensive Examinations in these fields will be required of all candidates at the completion of the degree program. All students must meet the prescribed basic preparation of 3 credit hours in Middle Eastern international relations, domestic politics, and modern history, and must satisfactorily complete the interdisciplinary seminar offered by this program. To fulfill the tool requirement, candidates must demonstrate reading knowledge proficiency in an approved modern Middle Eastern language.

PUBLIC AFFAIRS

The program leading to the degree of Master of Arts in the field of Public Affairs allows the student to specialize in either domestic economics or domestic politics. The student may select courses in consultation with an advisor to emphasize either political science, economics, or American history, provided (1) that no more than 15 hours of courses are elected in one department under the 24-hour program with a thesis, or (2) that no more than 21 hours are elected in one department under the 36-hour program without a thesis. Course work may include economics (public finance, monetary theory and policy, labor economics, industrial organization, natural resources and environmental economics, regional and urban economics, economic policy); history (U.S. political history, U.S. economic history, recent U.S. history); political science (domestic politics and government, Congress and the presidency, U.S. constitutional law and politics, state and urban politics, political science research methods, and science, technology, and public policy).

RUSSIAN AND EAST EUROPEAN STUDIES

This degree program is designed to give the student a broad grasp of Russian and East European affairs on an interdisciplinary basis, with emphasis on the period since 1917. The program provides an opportunity for students to gain knowledge of special areas of interest from among the following: Soviet internal and external affairs (required field of study), Soviet and Eastern European economics, ideology and thought, Russian literature and culture, Soviet military policy and strategy, 19th-century Russian history, comparative and international aspects of communism, Eastern European history, Eastern European government and politics, and advanced Soviet government, politics, and foreign policy. A concentration in Russian literature and culture is available in this program.

The degree program consists of 30 semester hours, including 6 hours of thesis research, or 36 semester hours of course work without the thesis. All students must take 6 to 9 hours in the interdisciplinary field covering Soviet internal and external affairs. In the 30-hour program, students select two other fields and must include one course in Eastern European history or politics; in the 36-hour program, students select three other fields and must include one field in Eastern European history or politics. All candidates will be required to take Master's Comprehensive Examinations in these fields. Before the Comprehensive Examinations can be taken, Russian language proficiency must be demonstrated in a reading comprehension examination. All students must have the required background preparation of at least 9 credit hours in Russian history and Soviet government and politics and 12 credit hours in Russian language study.

Students in the concentration in Russian literature and culture may take either the thesis or non-thesis option. They must take the required field in Soviet internal and external affairs in addition to the selected fields in literature and culture. The approved fields include 19th-century Russian literature, Soviet literature, and Russian culture.

SCIENCE, TECHNOLOGY, AND PUBLIC POLICY

This degree program allows students to focus on the interactions among scientific development, technological change, and government activities at the domestic or international level. The program consists of 36 semester hours (which may include 6 hours of thesis research). All students take a minimum of

12 semester hours in the core field of science, technology, and public policy and a minimum of 6 semester hours in a field related to public policy analysis. A third field is developed in consultation with program advisors to match the particular interests of the student.

The core field can contain courses covering domestic and international dimensions of science, technology, and public policy issues; the economics of technological change; technology assessment and the study of the future; energy policy; space policy; technology transfer; and a variety of other topics. The policy analysis field can draw upon course offerings in political science, economics, or public administration. The objective of the degree program is to train individuals to understand and manage issues of science and technology policy.

SECURITY POLICY STUDIES

The 36-hour, four-field program leading to the degree of Master of Arts in the field of security policy studies is explicitly policy oriented and professional in the sense of attempting to prepare students for policy-oriented positions in the defense/national security field. A student's degree program will be carefully planned with an advisor. All degree candidates are required to take 12 semester hours in the core field of defense policy analysis. In addition, students should have a minimum competence in economics equivalent to Econ 217–18. At least one field should be selected from among the following: international security policy; military history/history of strategic thought; Soviet military policy and strategy; science, technology, and public policy; and advanced quantitative analysis. The remaining two fields are to be selected from any of the above, or from any other field offered in the School's various programs. The tool requirement must be satisfied by demonstration of proficiency in statistics or a foreign language.

SPECIAL PROGRAMS

Combined Master of Arts and Juris Doctor Degree Program

The School of Public and International Affairs cooperates with the National Law Center in offering a program leading to the combined degrees of Master of Arts and Juris Doctor. A student must be accepted for admission by both the School of Public and International Affairs and the National Law Center. Applications should be made separately but at the same time. Both the School and the Center should be notified that the student is interested in the combined program. The student will be admitted to the School of Public and International Affairs for the academic year following the first year of study at the National Law Center, since the National Law Center stipulates that the first year of course work for the Juris Doctor degree must be taken as a unit.

The Master of Arts degree program normally consists of the 30-semester-hour program that includes a thesis. The student selects a major offered by the School and fulfills all of the requirements for the Master of Arts degree as well as fulfilling the requirements for the Juris Doctor degree. Up to 6 semester hours of credit for course work completed as part of the Juris Doctor curriculum and related to the student's degree program may be approved for transfer toward the Master of Arts degree. (Some of the course work required for the Master of Arts degree program may be applicable toward the Juris Doctor degree requirements.) Students will be registered in both the School of Public and International Affairs and the National Law Center and must maintain this concurrent

registration until all degree requirements have been completed. All work for this combined degree program must be completed in five years, unless an extension of time is granted by the dean.

Institute for Sino-Soviet Studies

The Institute for Sino-Soviet Studies provides a program of specialized graduate study and research within the School of Public and International Affairs. Courses of the Institute are drawn from a variety of academic areas and thus provide an interdisciplinary approach to the study of the Soviet Union, Eastern Europe, and East Asia, and of the Communist movement within and among the countries of these areas. Faculty members conduct seminars and reading courses in the disciplines of economics, geography, history, language and literature, law, political science, and psychology. Research work is integrated with the teaching program.

Students who are preparing for the degree of Master of Arts in the fields of East Asian studies, international affairs, and Russian and East European studies in the School of Public and International Affairs, or for the degree of Master of Arts in the fields of economics, history, or political science in the Graduate School of Arts and Sciences, with specialization in Sino-Soviet studies, may take course work from the Institute's offerings.

Doctoral candidates in the field of political science will take their Sino-Soviet work in the form of appropriate subfields of the major and minor fields. Doctoral candidates in the field of history are expected to take at least two of the four fields for the degree in the history of the countries of their specialization. All work leading to the degree of Doctor of Philosophy is under the general supervision of the Graduate School of Arts and Sciences. Consultative committees designated by the Graduate School direct the work of each student upon admission to degree candidacy. A faculty member of the Institute will serve as advisor to the candidate. The candidate's committee will be formed from members of the selected disciplinary department. A candidate for such a degree should assume that the committee will require the substitution of a reading examination in Chinese or Russian for one of the two Western languages normally required for the degree.

Center for Advanced Studies of the Americas

George Washington University is a founding member of the Center for Advanced Studies of the Americas. The Center helps students interested in inter-American affairs take advantage of Washington's wide-ranging resources in this field. The Center provides students supplementary guidance on the full range of courses related to their fields of interest that are offered by participating universities, internships in international organizations in the Washington area (such as the Organization of American States and the Inter-American Development Bank), and opportunities to participate in programs with visiting Latin American scholars and in the Washington diplomatic community.

DIVISION OF CONTINUING EDUCATION AND SUMMER SESSIONS

Dean W.F.E. Long
Associate Deans A.C. Jensen, S.R. Paratore
Assistant Deans G.E. Jones, B.J. Moreland, J.H. Pappalardo, A.O. Smith

INTRODUCTION

The Division of Continuing Education and Summer Sessions provides continuing education programs for adult learners by administering the off-campus offerings of the colleges and schools of the University, at both the undergraduate and graduate levels. Also offered are courses, seminars, and workshops for those seeking personal enrichment or the updating and upgrading of professional credentials. Special programs of study are developed in response to specific needs of the government and business communities. The Division includes a center to foster major improvements in the U.S. corrections system, a center designed to improve the flow of science communications information, and the George Washington University television station.

The staff of instruction for Division programs includes members of the full-time faculty of the University and academically qualified part-time lecturers from the professional community.

The Division works closely with education directors, public school officials, and personnel administrators in government, business, and industry to develop courses of study for mature students. In cooperation with sponsoring groups from government and business, the Division offers courses at off-campus centers in the District of Columbia and suburban Maryland and Northern Virginia. The Division also offers, through its Tidewater Center, graduate degree programs in various disciplines at locations in the Hampton, Norfolk, and Virginia Beach area. A wide range of seminars and workshops is available to organizations and individuals from the professional community.

Any organization interested in having the Division organize and conduct a course or a comprehensive educational program should contact the Division of Continuing Education and Summer Sessions.

The academic standards of the University are maintained in off-campus credit courses. The Division of Continuing Education and Summer Sessions is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools. All programs offered through the University's off-campus programs and administered by this Division are approved through the procedure authorized by the Board of Trustees and the Charter granted by the Congress of the United States. Degrees are granted through the faculties of the degree-granting schools and colleges of the University. Credit earned through off-campus study conforms to academic standards throughout the University. All Division off-campus offerings in Maryland are approved by the Maryland State Board for Higher Education; those in Virginia are approved by the Commonwealth of Virginia Council of Higher Education.

Except as outlined below, all general University regulations apply to students in the Division of Continuing Education and Summer Sessions. In addition, Division students are subject to all special requirements of the school through which they are taking courses.

ADMISSION AS A DEGREE CANDIDATE IN OFF-CAMPUS PROGRAMS

Students wishing to be admitted as candidates for one of the off-campus undergraduate or graduate degree programs of George Washington University

may obtain application forms from the Division of Continuing Education and Summer Sessions, one of the University's off-campus representatives, or the education officer of their agencies or installations.

Mature students who do not meet University undergraduate admission requirements (see Admissions) may be considered for degree candidacy after the satisfactory completion of at least 15 semester hours of course work with a grade point average of 2.00 or better. This must include courses in English composition (Engl 9 or 10 and 11) and 9 semester hours of course work in at least two of the following areas: humanities (literature, philosophy, foreign language), social sciences (anthropology, economics, geography, history, political science, psychology, sociology), and natural and mathematical sciences.

NONDEGREE STUDENTS

Off-campus credit courses may be taken by nondegree students who meet the prerequisites prescribed by the department concerned. Formal University admission is not required for registration in off-campus courses.

CHANGES IN PROGRAM OF STUDIES

Dropping an Off-Campus Course—A student may drop a course without academic penalty during the first third of the semester (first through third class meetings in the School of Government and Business Administration; first through fourth class meetings in all other schools) by completing an Off-Campus Change Slip that has been signed by the instructor and submitting it to the appropriate University representative. Withdrawal from a course without academic penalty after this period requires approval of a written request accompanied by the completed change slip and submission to the appropriate dean.

A student must follow these procedures in order to drop any course. Notifying the instructor of the intention to drop a course does not constitute an official withdrawal. The instructor indicates on the change slip whether the student is passing. The effective date of withdrawal and decisions regarding refunds are determined by the appropriate dean. Failure to follow the proper procedure results in the recording of a failing grade and, regardless of the time of discontinuance, does not relieve the student of financial responsibility for the entire course.

Off-Campus Change Slips may be obtained from the instructor, installation education office, or the Division of Continuing Education and Summer Sessions.

DEGREE PROGRAMS

Columbian College of Arts and Sciences offers the following degree programs off campus:

Associate in Arts in General Studies
Associate in Science in Cartography
Bachelor of General Studies
Bachelor of Science in Cartography

The Graduate School of Arts and Sciences* offers the following degree programs off campus:

* For program information, see the field concerned under Courses of Instruction.

Master of Arts or Master of Science
Fields and Concentrations: administrative sciences, crime in commerce, criminal justice, legislative affairs, telecommunications policy
Master of Forensic Sciences

The School of Engineering and Applied Science* offers the following degree programs off campus:
Master of Engineering Administration
Master of Science
Major Fields: communications, computer science, information management, operations research, systems analysis and management
Professional Degrees (Engineer and Applied Scientist)

The School of Education and Human Development† offers the following degree programs off campus:
Bachelor of Arts in Education and Human Development
Major Fields: human services, special education: complementary teacher program
Master of Arts in Education and Human Development
Major Fields: adult education, classroom teaching, early childhood special education, higher education, human resource development, supervision and human relations, vocational/special education
Education Specialist

COLUMBIAN COLLEGE OFF-CAMPUS PROGRAMS

Through Columbian College of Arts and Sciences, the Division of Continuing Education and Summer Sessions offers associate's and bachelor's degree programs in General Studies and Cartography. Further information about these programs, which are described below, is available from the Division or from Columbian College.

Residence Requirements

For the Associate's Degrees—The last 15 semester hours must be completed in residence as a candidate for the associate's degrees. A portion of the academic work taken to qualify for degree candidacy may be accepted in partial satisfaction of the residence requirement, if the courses are approved as part of the student's degree program.

For the Bachelor's Degrees—A minimum of 30 semester hours, including at least 12 hours in the area of concentration, must be completed in residence as a candidate for the degree sought. Unless special permission is granted by the appropriate dean to pursue work elsewhere, the work of the senior year must be completed in residence. This requirement applies to students transferring within the University as well as to students transferring from other institutions. The 15 hours taken in order to be considered for degree candidacy may be counted in residence. For regulations governing military students who are transferred when they are within 6 semester hours of their degrees, see the Servicemember's Opportunity College Agreement below.

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* See the School of Engineering and Applied Science *Bulletin*.
† For programs offered, see the section of this *Bulletin* on the School of Education and Human Development.

Associate in Arts in General Studies

Academic Advisor Debra Bearman

Upon the satisfactory completion of the requirements set by Columbian College of Arts and Sciences, the degree of Associate in Arts in General Studies is conferred. Students who plan to continue working toward an off-campus bachelor's degree offered by Columbian College must apply to the Division's Office of Student Services upon completion of the requirements for the degree of Associate in Arts in General Studies. Forms for this purpose are available from the Division office.

After completing the degree requirements, students may wish to transfer to an on-campus degree program within the University, or they may wish to transfer to another institution. However, modifications in admission, advanced standing, and curriculum requirements permitted in the Associate in Arts in General Studies degree program may not be accepted in transfer. Therefore, while registered for this degree, students should meet the requirements of the college, school, or university to which they may wish to transfer.

Scholarship—The system of grading is described on page 45. For regulations concerning probation, suspension, and readmission, see page 67.

CURRICULUM

The satisfactory completion of 60 semester hours of college work in the following curriculum is required. Students who plan to pursue a bachelor's degree are advised to plan their program so that they will have satisfied prerequisites toward the bachelor's degree of their choice.

		Semester Hours
Composition:	Engl 9 or 10, 11	6
Communication:	CmTr 1, 11, 111, or 121	3
Humanities:	Nine semester hours selected from the following: Art 31–32, 71–72; Engl 43–44; 45–46; 51–52; 71–72; Mus 3, 4; Phil 50; Rel 9, 10, 59, 60	9
Math/Science:	Three courses selected from the following: BiSc 3–4, 11–12; Chem 3–4, 5–6; Geol 1–2, 3, 4; Math 3, 6, 9, 10, 30, 31, 41, 42, 51, 52; Cart 103–4; Phys 1, 2, 9–10; Stat 51, 53, 101–2, 129	9–12
Social Sciences:	Nine semester hours are required, each course chosen from one of two departments, selected from the following: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1, 2; Hist 39–40, 71–72; PSc 1, 2; Psyc 1, 8; Soc 1, 2	9
Elective:		21–24
	Total	60

Bachelor of General Studies

Academic Advisor Debra Bearman

The Bachelor of General Studies curriculum aims to provide the adult part-time student with the opportunity to obtain a broad education. For that reason the course work required in the first and second years is distributed among communications (written and oral), the humanities, natural and mathematical sciences, and the social sciences. In choosing the third- and fourth-year course work required in departments related to their concentration, students should obtain counseling through the faculty advisor.

Students planning to work toward master's degrees are advised to plan their bachelor's programs so that they will meet the prerequisite requirements of the school or college of their choice. Students planning to enter graduate programs that require a reading knowledge of a foreign language are advised to include two years of a foreign language in their bachelor's program.

Scholarship—To qualify for graduation, students must pass 120 hours of course work and achieve an index of 2.00 based on courses graded on a 4.00 scale. At least 60 hours of course work, including the general course requirements, must be taken outside the major department or program. Students must also achieve no lower than the grade of C in required courses in the selected area of concentration. A *D* in a required course will satisfy a curricular requirement in the area of concentration and may count toward the total 120 hours, but it shall *not* count toward the minimum number of hours required in the area of concentration.

The system of grading is described on page 45. For regulations concerning probation, suspension, and readmission, see page 67.

FIRST AND SECOND YEARS

		Semester Hours
Composition:	Engl 9 or 10, 11, 20	9
Communication:	CmTr 1, 11, 111, or 121	3
*Humanities:	Twelve semester hours selected from the following: Art 31–32, 71–72; Engl 43–44, 45–46, 51–52, 71–72; two years of one foreign language; Mus 3 and 4; Phil 50; Rel 9 and 10, 59, 60; Slav 91–92	12
Math/Science:	Six to eight semester hours selected from the following: BiSc 3–4, 11–12; Chem 3–4, 5–6; Geol 1–2, or 3 and 4; Cart 103–4; Phys 1, 2, 5, 6, or 9–10	6–8
	Six to eight semester hours selected from the following: Math 3, 6, 9, 10, 30, 31, 41, 42, 51, 52; Stat 51, 53, 101–2, 129	6–8
Social Sciences:	Twelve semester hours selected from two of the following combinations: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1, 2; Hist 39–40, 71–72; PSc 1, 2; Psyc 1 and 8; Soc 1, 2	12
Electives:	(depending on science option)	8–12
	Total	60

THIRD AND FOURTH YEARS

Concentrations are offered in economics, history, mathematics, political science, psychology, and sociology. Concentration requirements are to be selected in consultation with the academic advisor. Students selecting economics, history, mathematics, or political science are required to complete 24 semester hours of 100-level courses in their area of concentration and 18 semester hours of courses, selected in consultation with the faculty advisor, in two or more related departments.

Students selecting psychology or sociology are required to complete 18 semester hours of 100-level courses in their area of concentration and 24 semester hours of courses, selected in consultation with the faculty advisor, in

* Students who plan to continue study for advanced degrees are urged to fulfill the two-year language option

two or more related departments. The remaining 18 credit hours required for graduation may be in elective courses.

Associate in Science in Cartography
Bachelor of Science in Cartography

Director and Faculty Advisor Arthur Viterito

The course work in these two- and four-year curricula is offered both on and off campus. However, the cartography courses are given primarily at selected off-campus locations. Students whose native language is not English must present a minimum TOEFL score of 525 to be considered for admission.

GENERAL REQUIREMENTS

The associate's degree program requires satisfactory completion of 60 semester hours; the bachelor's degree program, 120 semester hours. All candidates for the Bachelor of Science in Cartography will pursue a general arts and sciences curriculum until they begin work in the major field; they must complete the two general course requirements listed below. Candidates for the associate's degree must complete the English requirement (No. 1 below).

The two general requirements are the following:

1. Each student must, during the freshman year, demonstrate adequate achievement in the field of English composition, either by examination or by taking English 9 or 10 and 11 or 12. This requirement may not be postponed; it applies to the associate's and bachelor's degrees.

2. Each student in the bachelor's degree program must at some point in the college career undertake a meaningful initiation into the three divisions of knowledge: humanities, natural and mathematical sciences, and social sciences. As each major field will represent one of these three areas, the requirement must be fulfilled by taking no less than six semester hours in each of the other two areas (see pages 70–71).

Servicemember's Opportunity College

George Washington University has been designated a Servicemember's Opportunity College (SOC). SOC provides opportunities for those in active duty to pursue educational program goals through courses offered on base. In support of the concept, George Washington University, while still maintaining its academic standards, assumes the responsibilities of meeting the educational needs of an individual serving in the Armed Forces. Individuals who apply for admission as candidates for either associate's or bachelor's degrees from George Washington University's Columbian College of Arts and Sciences may, at their request, be designated as SOC students. Such students will be assured of a degree completion program through use of the agreement that follows.

AGREEMENT

George Washington University, a Servicemember's Opportunity College, agrees to the following:

1. Upon admission to Associate in Arts in General Studies or Bachelor of General Studies degree candidacy, the student may take the required course work either on or off campus. Regardless of where taken, courses of study taken while a degree candidate may be applied toward the degree sought, as a requirement or an approved elective. Although the grade of *D* is not acceptable for transfer, it may be used to satisfy a curriculum requirement. It may not, however, be counted toward the total number of semester hours required for

the degree, and it should not be repeated. Courses will be taken from George Washington University unless the servicemember is transferred to a location not served by this University. In the case of transfer and in consideration of the student's future assignment, arrangements will be made between the student and the counselor assigned by the Division of Continuing Education and Summer Sessions to ensure that the courses taken elsewhere satisfy the George Washington University program.

II. Academic credit may be obtained by any one or a combination of the following:

A. Registration as an on- or off-campus, full- or part-time student at this University.

B. Advanced standing for academic studies taken at other accredited institutions when such studies meet the requirements for the degree or by examination.

Within the maximum of 45 hours of credit allowed for advanced standing toward the Associate in Arts in General Studies degree, a maximum of 30 hours may be obtained by any one or combination of the methods below. Within the maximum of 90 hours of credit allowed for advanced standing toward the Bachelor of General Studies degree, a maximum of 60 hours may be obtained by any one or combination of the methods below.

1. *College-Level Examination Program (CLEP) Subject Examinations*—see pages 22–23. Maximum credit allowed for associate's degree is 30 semester hours; maximum allowed for bachelor's degree is 60 semester hours.

2. *College-Level Examination Program (CLEP) General Examinations*—see pages 22–23. Maximum credit allowed is 21 semester hours.

3. *Columbian College of Arts and Sciences Special Departmental Examinations*—see page 73. Maximum credit allowed for associate's degree is 30 semester hours; maximum allowed for bachelor's degree is 60 semester hours.

4. *Service Schools*—A maximum of 30 semester hours (or a maximum of 12 if the courses are "professional") may be obtained on the basis of service schools satisfactorily completed, as evaluated in accordance with the "Guide to the Evaluation of Educational Experience in the Armed Forces," issued by the Committee on Accreditation of Service Experience. Ordinarily such subjects are counted as electives. No credit will be allowed for military experience as such.

5. *Correspondence Courses*—A maximum of 15 semester hours may be earned through the successful completion of correspondence courses of college level that are offered by the U.S. Armed Forces Institute or a regionally accredited college or university.

III. The minimum requirement for the Associate in Arts in General Studies degree is 60 semester hours; the minimum requirement for the Bachelor of General Studies degree is 120 semester hours. A minimum of 15 semester hours for the associate's degree and a minimum of 30 hours for the bachelor's degree must be completed at George Washington University, but may be completed at any point in the student's program of study. At least 12 semester hours in the selected area of concentration must be taken at this University.

IV. The Division of Continuing Education and Summer Sessions will handle and coordinate administrative matters and be the point of contact with the college granting the degree. The provisions as stated in the Division of Continuing Education and Summer Sessions *Off-Campus Schedule of Classes* will apply in all cases not specifically mentioned in this agreement.

V. Tuition and fees will be as stipulated in the Division of Continuing

Education and Summer Sessions *Off-Campus Schedule of Classes* on a year-to-year basis.

VI. Students accepted under this program are subject to the probation and suspension regulations of the University and are required to maintain scholastic standards.

VII. In addition to trained counselors, University representatives are assigned to each installation to assist in the counseling function.

DIVISION PROGRAMS

The Division of Continuing Education and Summer Sessions administers the activities of the Center for Continuing Education in Washington, the English for International Students Program, the Office of University Students, the Summer Sessions Office, the National Center for Innovation in Corrections, the GWU television station, and Science Communication Studies.

CENTER FOR CONTINUING EDUCATION IN WASHINGTON (CCEW)

The Center provides a broad spectrum of services focusing on innovative nontraditional, career-oriented education. Among CCEW programs are noncredit, graduate-level career certificate programs to prepare the legal assistant publication specialist, landscape designer, fund raising administrator, administrative manager, association executive, information systems specialist, publi relations professional, and Washington representative. Other programs ar designed to prepare the certified employee benefit specialist and certifie financial planner. Credit courses and test review courses (for CLEP, EIT, FSI GMAT, GRE, LSAT, MAT, MCAT, and Basic Real Estate) are offered as well

Workshops and short-term courses provide the opportunity for individuals to be informed of the innovations in their fields. Courses focus on advances in computer technology and train participants to increase personal effectiveness improve managerial expertise, reinforce leadership ability, identify practica decision-making skills, broaden understanding of systems and concepts, and develop understanding of financial, political, and social strategies. The Profes sional Development Program, designed to enhance the skills, productivity, and job satisfaction of an organization's employees, can provide these workshops credit courses, and noncredit courses on site or through interactive television

The Center is the site of the University's Continuing Education for Women (CEW) program, which has provided counseling and educational services to women in transition since 1964. More than 16,500 participants have benefited from CEW programs, which currently include group and individual counseling services that are accredited by the International Association of Counseling Services, Inc. CEW also offers a series of special-interest courses focusing on issues confronting women; a one-year certificate program to train child care specialists; and three undergraduate certificate programs that combine academic credit courses with skill development workshops for supervisory specialists communication specialists, and social service specialists. Men as well as women may register for these programs.

For a complete listing of services, courses, and programs, see the *CCEW Schedule of Classes*.

ENGLISH FOR INTERNATIONAL STUDENTS

This comprehensive program in English as a foreign language is designed for persons enrolled or planning to enroll in University credit programs, for

members of Washington's international community, and for other individuals who wish to improve their command of English through an intensive or semi-intensive study program. Courses offered at various levels of proficiency, covering both oral and written communication, are scheduled in 14-week sessions during the fall and spring semesters and in two 10-week sessions during the summer. Students entering the program take a battery of tests to determine level of proficiency for placement in English and academic programs. Registration for the tests is held in advance of course registration at the Office of English for International Students, Academic Center, 801 22nd St., N.W., Suite T604, Washington, D.C. 20052. A $30 testing and application fee is charged each student. Persons from outside the United States requesting admission and needing a student visa will be considered for an I-20 certificate of eligibility for student visa validation. Those interested in applying for a degree program should see Students From Foreign Institutions under Admissions for additional information.

OFFICE OF UNIVERSITY STUDENTS

The Office of University Students (OUS) makes on-campus credit courses available to those who are not currently degree candidates at this University. Such students, often employed in government or industry, may be taking courses to enhance their career potential or as a matter of personal interest. They may be candidates for higher degrees in other institutions, sent here for special work as part of a graduate program. They may be undergraduates matriculated elsewhere, taking courses for transfer to their own institution.

All courses except those restricted to medical and law students and those in the Departments of Accountancy, Business Administration, and Management Science are open to OUS students, provided they have sufficient preparation as determined by the academic departments. Students wishing to take engineering and applied science courses should consult the School of Engineering and Applied Science *Bulletin*.

Registration in a given course may be denied OUS students when space is needed for degree candidates. OUS students are not eligible to register for thesis or dissertation research nor for continuous enrollment or leave of absence. OUS requires a minimum registration of 3 semester hours per semester or session, except in special circumstances as approved by the dean.

Entrance Requirements*

An academic background appropriate for the program of studies contemplated is required. In addition, the applicant who has previously attended this or another college or university must be in good standing at that institution. An applicant who has been suspended from any educational institution for poor scholarship will not be considered for admission for one calendar year after the effective date of the suspension. An applicant who has been denied admission elsewhere within this University may be considered for admission through OUS upon recommendation of the appropriate department and school or college.

Applications for admission through OUS for a fall or spring semester must be received in the Office of Admissions no later than the Friday before the first day of registration (see the Calendar, pages 5–7). Applications for admission for the summer should be submitted at least two working days prior to registration

* For admission requirements for students from foreign institutions, see pages 25–26.

day. In both cases, however, applicants are urged to apply earlier. There is no application fee.

Regulations

See Admissions, Registration, Fees and Financial Regulations, and Regulations. Prospective and registered students are urged to acquaint themselves with the regulations concerning attendance (page 45) and withdrawal (page 47).

The following specifically apply to all students registered through OUS:
Last day to add a class for credit—end of second week of classes.
Last day to drop a class for credit or to withdraw from the University—end of the seventh week of classes.
Equivalent amounts of time apply to the summer sessions.

ACADEMIC WORK LOAD

For OUS students, the normal academic work load during the regular academic year is not more than 10 semester hours for a student employed more than 20 hours per week and not more than 18 semester hours for a full-time student. During the summer a student may take a maximum of two courses during any one session. Exceptions to these limits must be approved by the dean.

SCHOLARSHIP REQUIREMENTS

A student who fails to maintain the scholarship requirements of OUS may be dismissed from the University. A statement of scholarship requirements is available in the office of the dean.

All grades received in OUS remain on the record; scholarship requirements are based on the total record.

Grades—See page 45. There is no limitation on the number of courses that may be taken on a pass no pass basis in OUS; however, there may be a limit on the number that can be transferred to fulfill degree requirements.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) and *W* (Authorized Withdrawal) may be assigned are described on page 45.

Removing an Incomplete—The instructor normally sets a period within which the uncompleted work must be made up. An Incomplete that is not removed within this period remains as a grade of *I* on the student's record.

CHANGE IN PROGRAM OF STUDIES

Change Within the Office of University Students—A student may not change or drop courses (see Withdrawal, page 47) or change status to that of auditor except with the approval of the dean.

Transfer Within the University—Transfer to or from OUS may be made only with the approval of the deans concerned. Application for transfer to degree candidacy will be considered only after the completion of at least one semester in OUS or upon request from the college or school to which the student is seeking admission. Students wishing to transfer to degree candidacy must meet the conditions of the college or school to which they are applying. It is the responsibility of the student to consult the relevant degree-granting college or school concerning all conditions to be met and the amount of work transferable.

COLLEGE PROGRAM FOR SECONDARY SCHOOL STUDENTS

The George Washington University College Program for Secondary School Students provides an opportunity for well-qualified high school students to take fully accredited college courses along with college students. Through the Program, high school students may enroll in a wide variety of summer courses prior to their junior or senior year. Those residing in the Washington metropolitan area may enroll in fall or spring semester courses that supplement their junior- and senior-year high school programs.

The College Program offers diversified cultural, social, and recreational experiences during the summer. Opportunities for observation, study, and recreation are limited only by the student's time, energy, and imagination.

During the summer program, students from outside the Washington area must reside on campus in a University residence hall. Local residents may choose to stay in on-campus housing during the summer; housing is not available for part-time commuting students who are taking college course work concurrently with their high school program during the fall and spring semesters.

Scholarships—Summer program students with outstanding academic records and excellent standardized test scores will be considered uniformly for full-tuition scholarships. Tuition awards are also available to superior students enrolled during the fall and spring semesters. Because the awards are based on academic merit rather than financial need, only the program application is required for consideration, though the Admissions Coordinator may request updated test scores and or high school transcripts. The amounts awarded cover tuition only and cannot be applied to housing, meals, or fees.

For further information and an application, please write the College Program for Secondary School Students, Office of Admissions, George Washington University, Washington, D.C. 20052.

SUMMER SESSIONS OFFICE

Courses are offered during the summer by all degree-granting divisions of the University: Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Medicine and Health Sciences, the National Law Center, the School of Engineering and Applied Science, the School of Education and Human Development, the School of Government and Business Administration, and the School of Public and International Affairs. During the summer the University also offers special programs that are not available during the regular academic year. Courses are offered during both day and evening hours.

Students who are enrolled at the University for the spring semester may register for the following Summer Sessions without special application. All others must apply for admission or readmission. No application fee is charged nondegree students. Those who wish degree status may seek admission from the appropriate college or school within the University. Those who do not wish to work toward a degree at the University may apply through the Office of University Students and are subject to its entrance requirements and regulations stated above.

For a complete statement concerning summer term work, see the *Summer Sessions Schedule of Classes*.

NATIONAL CENTER FOR INNOVATION IN CORRECTIONS

The purpose of the National Center for Innovation in Corrections, another unit of the Division of Continuing Education and Summer Sessions, is to foster major improvements in the U.S. system of corrections through the study and promotion of prison industries, literacy training, and related activities. Areas of emphasis include the alleviation of idleness caused by overcrowding, the increase of inmate productivity through prison industries, and the establishment of programs designed to help inmates defray some of the costs of incarceration. In its initial year, the National Center for Innovation in Corrections will work in cooperation with task force committees to conduct a comprehensive study to determine the present status of prison industries and to define what is needed to make prison industries more viable for the future. In addition to coordinating the study, the Center must identify the resources needed to implement the study. Contingent upon study results, the Center will assist in the implementation of recommendations to further prison industry.

GW TELEVISION

State-of-the-art production and broadcasting capabilities are available on campus through the GWU television station. Operating from studios located in the Academic Center, 801 22nd Street, N.W., the instructional television system airs live and videotaped courses and programs on up to four ITFS channels. Initial goals of GW Television are to extend educational opportunities off campus to meet specialized community needs; to provide University faculty with the opportunity to create original educational materials for the increased benefit of students; and to provide the community with convenient facilities for various production services.

SCIENCE COMMUNICATION STUDIES

The mission of Science Communication Studies (SCS) is to improve the flow of information from those who generate the information to those who use it. SCS is actively engaged in science communication research and information technology. It educates and informs via conferences, telecommunications, film, publications, and other media. The broad areas in which SCS is currently active include education and practical training, research, and information services.

SCS uses the tools of today—ranging from conventional literature searches to telecommunication processes—to collect, organize, and analyze information. Research programs generate new information and new services, and systems are developed for subject control and access to technical literature in the social and physical sciences. Library and information services are provided.

NONCREDIT COURSES AND PROGRAMS

In addition to the noncredit offerings of the Division, the University also offers a variety of noncredit professional development courses and programs through the School of Government and Business Administration (through its Continuing Professional Education Office), the School of Engineering and Applied Science (through its Continuing Engineering Education Program), and the School of Education and Human Development (through its Center for Research and Services).

POLICY STUDIES AND SPECIAL PROJECTS

Acting Vice President for Policy Studies and Special Projects C.J. Lange

The Vice President for Policy Studies and Special Projects is responsible to the President of the University for developing an interdisciplinary capability for analyzing national policy issues. There is involvement with the Consortium universities and with foundations, federal agencies, industry, and other organizations that interact with the governmental process.

The office serves the University as a locus for discussion and as an advisory resource on interdepartmental and interdisciplinary research related to the analysis of public policies, and on curricula pertaining to broad social or environmental problems.

The University has sustained an institutional commitment, in terms of faculty recruitment and program emphasis, to issue-oriented policy analysis as a major focus of teaching and research activities. The result of many years of development is a significant, institutional capability for comprehensive analysis of complex policy issues. Major programs oriented to public policy and governmental functions, which come within the ambit of this office, are described below.

PROGRAM OF POLICY STUDIES IN SCIENCE AND TECHNOLOGY

Acting Director J.M. Logsdon
Executive Associate Pamela B. Smith

The Program's primary objective is the continuing development of a University-wide policy research capability related to problems stemming from the impact of technological change on the processes, values, and institutions of society. The Program provides a neutral forum for consideration of these policy issues—whether in a retrospective, current, or prospective context—and provides an advisory and research resource for policymakers in the public and private sectors.

The Program's primary components are the following:

1. *The Technology Assessment Group*—The Program has been closely involved with the evolution of the concept of technology assessment (TA), which has become federally institutionalized in the Congressional Office of Technology Assessment. Much of the early work of the Program consisted of theoretical, methodological, institutional, and historical studies. Since 1973, however, the TA Group has carried out studies in a variety of subject areas, including transportation, energy, community development, environmental noise, communications, and governmental structure and process, under contracts or grants from most of the major federal agencies.

2. *The Graduate Program in Science, Technology, and Public Policy*—This Master's degree program—cosponsored by the Program of Policy Studies and the School of Public and International Affairs (SPIA)—combines graduate training in science policy analysis with major research undertakings. The program is the largest degree-granting science policy program in the United States. Admissions information is contained in the SPIA section of this Bulletin.

The Program of Policy Studies normally has between 10 and 15 professionals and many students working on several projects, most of which are problem oriented and interdisciplinary in nature. Members of the faculty, graduate students, members of governmental agencies, and special consultants are regularly involved in the studies. To date the Program has performed more than

100 policy studies and has published more than 200 reports, monographs, books, and special papers that have been distributed to professionals and institutions throughout the world. Funding for the Program's activities has come from a variety of sources: the University; federal agencies, including DOA, DOE, EPA, HHS, HUD, NASA, NSF, OTA, and Commerce; and private foundations, including the Ford Foundation, General Service Foundation, German Marshall Fund, Markle Foundation, and Russell Sage Foundation.

Professional Associates

Acting Director John M. Logsdon, *Research Scientist; Director, Graduate Program in Science, Technology, and Public Policy; Professor of Public Affairs and Political Science*
James M. Brown, *Senior Staff Scientist; Professor of Law*
Thomas Dietz, *Research Associate (Sociology/Environmental Policy)*
Peter R. Huessy, *Research Associate (Policy Analysis and International Affairs)*
Charles V. Kidd, *Senior Staff Scientist (Public Affairs)*
Samuel Robert Lichter, *Assistant Professor of Political Science*
Joseph Mintzes, *Consultant (International Affairs)*
Henry R. Nau, *Graduate Program in Science, Technology, and Public Policy; Professor of Political Science and International Affairs*
Herman Pollack, *Research Professor of International Affairs (Political Science)*
Michael J. Robinson, *Scientist (Political Science/Media Analysis)*
Claire B. Rubin, *Research Associate (Natural Hazards/Emergency Management)*
Robert W. Rycroft, *Deputy Director, Graduate Program in Science, Technology, and Public Policy; Associate Professor of Public Affairs and Political Science*
J. Eleonora Sabadell, *Senior Staff Scientist (Natural Resources Policy)*
Charles L. Trozzo, *Senior Staff Scientist (Economics)*
Anne C. Webb, *Research Associate (Policy Analysis and International Affairs)*

NATIONAL HEALTH POLICY FORUM

Director Judith Miller Jones

The National Health Policy Forum assists professional staff members employed by the executive and legislative branches of the federal government in gaining a better understanding of health delivery practices and current public policy issues. Its purpose is to facilitate communication between Washington health policymakers and experts in the field who represent the academic community, labor, industry, the health professions, and consumer groups. Exposure to problems and issues facing the entire country is gained primarily through sequenced seminar discussions or workshops and, when appropriate, site visits. Although attendance is primarily limited to Congressional aides and top-level health staff from the many government agencies involved in health, George Washington University students and faculty can be accommodated on a space-available basis.

SPONSORED RESEARCH

Vice President for Administration and Research C.J. Lange

These special programs were established for the specific purpose of considering, in an academic atmosphere, problems proposed by the individual projects or submitted by the sponsoring agency. Cooperation between these programs and the various departments of instruction is as close as the nature and needs of the programs and departments will permit.

CENTER FOR SOCIAL POLICY STUDIES

Director Sar Levitan

The Center for Social Policy Studies is devoted to the evaluation of federally supported manpower, antipoverty, and related programs. The Center is financed by a grant from the Ford Foundation and offers, in conjunction with the Department of Economics, graduate courses in labor economics and social policy.

EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) CLEARINGHOUSE ON HIGHER EDUCATION

Director Jonathan Fife

The Educational Resources Information Center (ERIC) Clearinghouse on Higher Education, established in the fall of 1968, is supported by the National Institute of Education. The Clearinghouse is responsible for the acquisition, evaluation, abstracting, indexing, and dissemination of research reports and other documents dealing with problems and issues in higher education. It prepares state-of-the-art and review papers related to higher education and responds to individual inquiries concerned with higher education.

INSTITUTE FOR MANAGEMENT SCIENCE AND ENGINEERING

Director W.H. Marlow

The Institute for Management Science and Engineering provides a multidisciplinary environment for innovative graduate teaching and substantial opportunities for research activities and public service under diversified sources of external support. Through its Program in Logistics, the Institute performs research leading to the development of a science in logistics, featuring principles and methodology for resource allocation problems in civil affairs and national defense efforts.

NATURAL RESOURCES POLICY CENTER

Director Mary Holman

The Natural Resources Policy Center was established in 1965 to sponsor faculty and student research in the area of natural resources and environmental quality; to develop and undertake activities that promote undergraduate and graduate education; and to train employees of public resource agencies. The program of the Center focuses particularly on increasing the contribution of the social sciences to the solution of contemporary problems relating to the management and development of natural resources. The Natural Resources Policy Center, which provides a focus on natural resource and environmental

quality problems and issues, is an integral part of the Department of Economics in both the design of its research program and its courses.

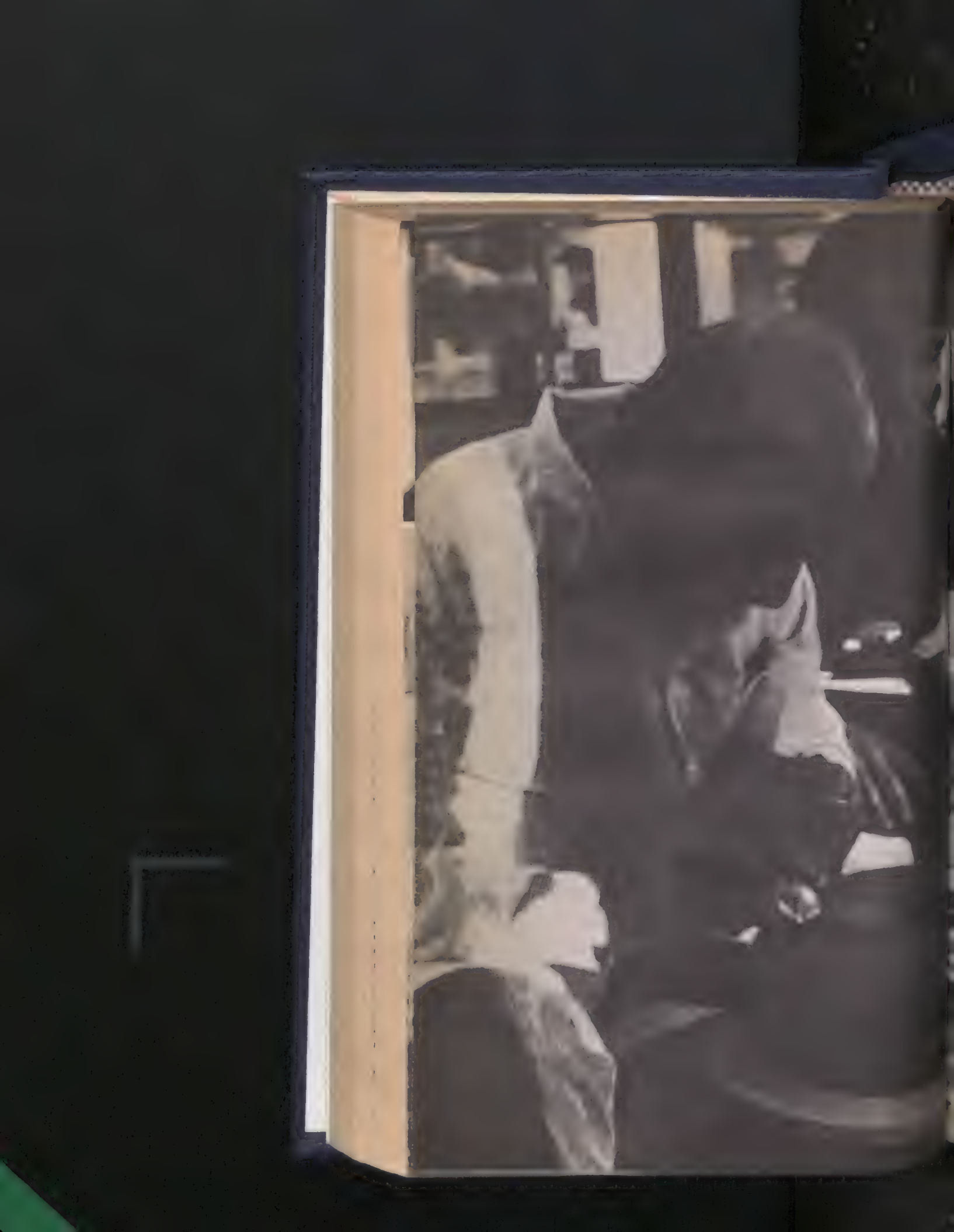
SOCIAL RESEARCH GROUP

Director Ira Cisin
Associate Director Philip W. Wirtz

The Social Research Group conducts surveys and experiments with concentration on basic research underlying an approach to the solution of social problems.







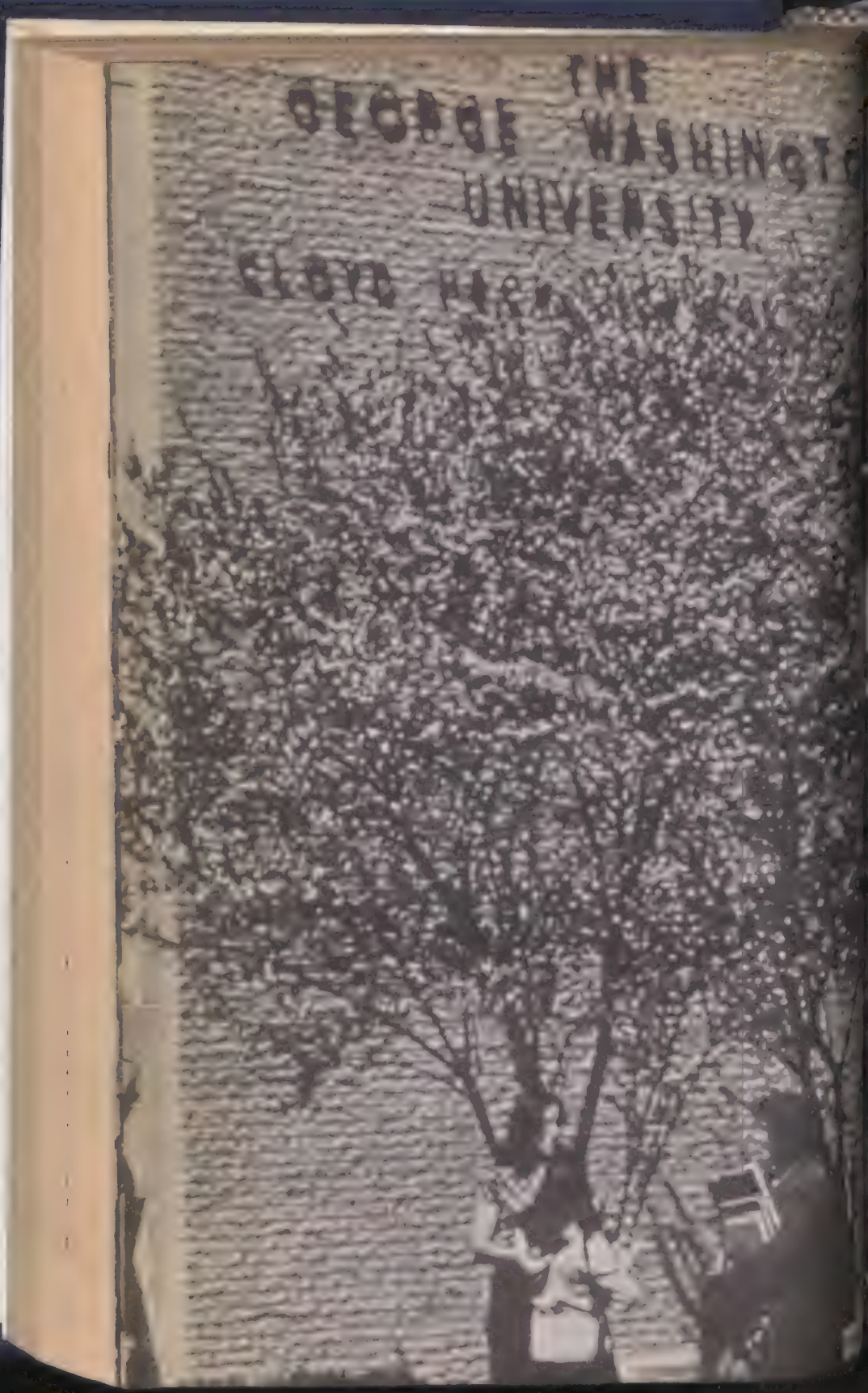




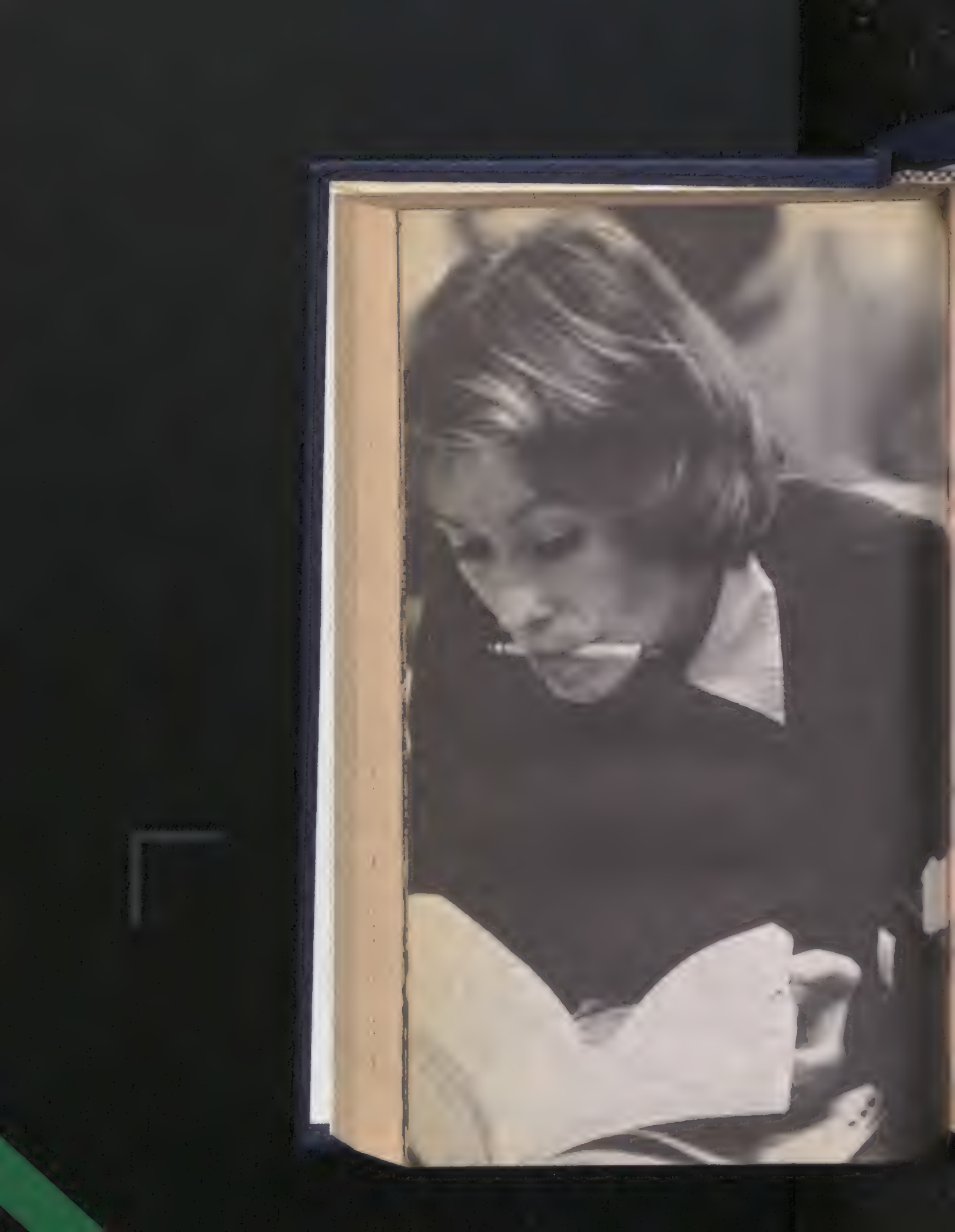







THE
GEORGE WASHINGTON
UNIVERSITY





COURSES OF INSTRUCTION

The following section provides listings and descriptions of courses offered by the departments of instruction and special interdepartmental programs. The courses as listed here are subject to change. The University reserves the right to withdraw any course announced or to change the course fees shown herein.

HOURS OF INSTRUCTION

Classes are scheduled in the morning, afternoon, and evening. Evening and daytime sections of the same course are identical, are taught by the same staff of instructors, and carry the same amount of credit.

EXPLANATION OF COURSE NUMBERS

First-Group Courses—Courses numbered 1–100 are planned for students in the freshman and sophomore years. With the approval of the advisor and the dean, they may also be taken by juniors and seniors. In certain instances, they may be taken by graduate students to make up undergraduate deficiencies or as prerequisites to advanced courses, but they may not be taken for graduate credit.

Second-Group Courses—Courses numbered 101–200 are planned for students in the junior and senior years. Except for accountancy courses, they may be taken for graduate credit only upon the approval of the Dean and the instructor at the time of registration. Such approval is granted only with the provision that students must complete additional work to receive graduate credit. Accountancy courses numbered 101–200 may not be taken for graduate credit.

Third-Group Courses—Courses numbered 201–300 in the Graduate School of Arts and Sciences and the School of Government and Business Administration and those numbered 201–400 in the School of Education and Human Development are planned primarily for graduate students. They are open, with the approval of the instructor, to qualified seniors; they are not open to other undergraduates. Qualified seniors in the School of Government and Business Administration registering for these courses must have a 3.00 average, the prior approval of the department chairman who is responsible for the graduate course, and the prior approval of the dean. Nondegree students who have not completed a bachelor's degree may not enroll in graduate courses offered by the School of Government and Business Administration.

Fourth-Group Courses—Courses numbered 301–400 in the Graduate School of Arts and Sciences are limited to graduate students, but they are primarily for doctoral candidates. Courses numbered 301–400 in the School of Government and Business Administration are limited to doctoral students. In the School of Education and Human Development fourth-group courses, numbered 401–500, are limited to graduate students with master's degrees from accredited institutions.

Fifth-Group Courses—Courses numbered 701 and 721 represent an ongoing program of curriculum innovation at GWU. The 701 number is used to designate experimental courses taught by individual faculty members. The 721 number designates innovative interdepartmental courses. Courses numbered in the 770s are taught by scholars who hold appointments as University Professors. The 700 numbers do not indicate the level of difficulty. Courses in this series range from freshman-level offerings to classes designed for seniors and graduate students. Unless the course description in the *Schedule of Classes*

indicates that there are prerequisites or that an interview with the instructor is required prior to registration. 700 courses are open to all interested students, subject to their advisor's approval and the rules of the respective colleges.

KEY TO ABBREVIATIONS

The following abbreviations are used for course designations:

Acct	Accountancy
AdSc	Administrative Sciences
AHA	Allied Health Administration
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
AM	Association Management
Bioc	Biochemistry
BiSc	Biological Sciences
BAd	Business Administration
Cart	Cartography
Chem	Chemistry
CH&D	Child Health and Development
Chin	Chinese
CE	Civil Engineering
Clas	Classics
ClEn	Clinical Engineering
CmTr	Communication and Theatre
CpMd	Computer Medicine
CSci	Computer Science
Derm	Dermatology
Econ	Economics
Educ	Education
EPol	Education Policy
EE	Electrical Engineering
EMed	Emergency Medicine
EAd	Engineering Administration
EngS	Engineering Science
Engl	English
EFL	English as a Foreign Language
E&RP	Environmental and Resource Policy
EnHe	Environmental Health
Envr	Environmental Studies
ForS	Forensic Sciences
Fren	French
Gnet	Genetics
Geog	Geography and Regional Science
Geol	Geology
Ger	Germanic Languages and Literatures
Gern	Gerontology
HCS	Health Care Sciences
HSA	Health Services Administration
Hist	History
HKLS	Human Kinetics and Leisure Studies
Hmn	Humanities
Idis	Interdisciplinary Courses
Ital	Italian
Japn	Japanese
Jour	Journalism
Kor	Korean
Law	Law
LEnf	Law Enforcement
Libr	Library
Mgt	Management Science
Math	Mathematics
ME	Mechanical Engineering
Med	Medicine
Micr	Microbiology
MStd	Museum Studies
Mus	Music
NSc	Naval Science
NSur	Neurological Surgery
Neur	Neurology
Ob&G	Obstetrics and Gynecology
OR	Operations Research
Opht	Ophthalmology
Orth	Orthopaedic Surgery
Path	Pathology
Phar	Pharmacology
Phil	Philosophy
Phys	Physics
Phyl	Physiology
PCm	Political Communications
PSc	Political Science
Port	Portuguese
Pchi	Psychiatry and Behavioral Sciences
Psyc	Psychology
PAd	Public Administration
PPol	Public Policy
RSci	Radiological Sciences
Rad	Radiology
Rel	Religion
SLP	Service Learning Program
Slav	Slavic Languages and Literatures
Soc	Sociology
Span	Spanish

SpEd	Special Education
SpHr	Speech and Hearing
Stat	Statistics/Computer and Information Systems
Surg	Surgery
TCom	Telecommunications Policy
T&T	Travel and Tourism
Univ	University
U&RP	Urban and Regional Planning
Urol	Urology
WStu	Women's Studies

SEMESTER HOURS OF CREDIT

The number of semester hours of credit given for the satisfactory completion of a course is, in most cases, indicated in parentheses after the title of the course. Thus, a year course giving 3 semester hours of credit each semester is marked (3–3), and a semester course giving 3 semester hours of credit is marked (3). A semester hour may be defined as one 50-minute period of class work or one laboratory period a week for one semester.

TIME OF COURSE OFFERINGS

Following most course descriptions is a parenthetical statement listing the semester (fall or spring) for which the course is scheduled. The term *academic year* is used only with two-semester courses and indicates that the first half of the course is to be offered in the fall semester and the second half in the spring semester. Not all offerings for the summer sessions are listed in this *Bulletin*. Students should consult the *Summer Sessions Schedule of Classes* for additional summer offerings. A *Schedule of Classes* is published each fall and spring semester to provide information concerning the time of course offerings.

ACCOUNTANCY

Professors A.J. Mastro, F.C. Kurtz, C.M. Paik, M.G. Gallagher (*Chairman*), J. Hilmy
Professorial Lecturers F.W. Segel, S.M. Farag
Associate Professorial Lecturer P. Ben Ezra
Assistant Professors D.R. Sheldon, W.F. Thomas, K.E. Smith, L.C. Moersen, L.G. Singleton, G.S. Wooding, N.J. Crimm
Assistant Professorial Lecturer H.S. Jones
Instructor D.M. Mattison

See the School of Government and Business Administration for programs of study in accountancy leading to the degrees of Bachelor of Accountancy, Master of Accountancy, Master of Taxation, and Doctor of Business Administration.

Accountancy courses numbered below 201 may not be taken for graduate credit. Accountancy courses numbered 201 and above may not be taken for undergraduate credit.

First Group

51–52 **Introductory Accounting** (3–3) Staff
Basic understanding of accounting concepts, procedures, analyses, and reports, the accounting measurement and communications of significant economic and financial data. Prerequisite: sophomore status. Acct 51 is prerequisite to Acct 52. Students who have received credit for a similar financial accounting course cannot receive credit for Acct 51. (Acct 51 and 52—fall and spring)

Second Group

101 **Cost and Budgetary Control** (3) Singleton
Cost behavior and volume-profit relationships, responsibility accounting, standard costs, cost structures for control and decision making, relevant

costs, cost concepts, and variance analyses. Prerequisite: Acct 51-52 and junior status. Students who have received credit for Acct 193 cannot receive credit for Acct 101. (Spring)

111 **Financial Statement Analysis** (3) Hilmy
Analysis and interpretation of financial statements for the guidance of management, directors, stockholders, and creditors. Prerequisite: Acct 51–52. (Fall and spring)

121 **Intermediate Accounting** (3) Mastro
In-depth study of accounting functions and basic theory: acquisition of assets and services, income and equity accounting, preparation and analysis of financial statements. Prerequisite: Acct 51–52 and junior status. (Fall)

132 **Accounting Theory** (3) Hilmy
Current thought as reflected in the pronouncements of leading professional and accounting research associations, major contributions to accounting literature. Prerequisite: Acct 121 and senior status. (Spring)

151 **Business Law for Accountants I** (3) Moersen
An introduction to business law concepts for the professional accountant. Contracts, bailments, commercial paper, secured transactions, property, agency, etc., with concern for professional accounting certification; the interrelationship of accounting standards, taxation concepts, and auditing standards with business law, and the legal liability and ethical standards of professional accountants. Prerequisite: Acct 51–52 and junior status. (Fall)

152 **Business Law for Accountants II** (3) Moersen
A broadening of business law concepts—partnerships, corporations, federal antitrust, labor, and securities. Legislation and litigation of the professional accountant's liability as an auditor and tax advisor. The interrelationship of accounting standards, taxation concepts, and auditing standards with business law, and the legal liability and ethical standards of professional accountants. Prerequisite: Acct 151 and senior status. (Spring)

161 **Federal Income Taxation: Individuals** (3) Crimm, Smith
A study of federal income tax concepts with primary emphasis on individuals. Prerequisite: Acct 51–52 and junior status. (Fall)

162 **Federal Income Taxation: Corporations, Partnerships, Estates, and Trusts** (3) Crimm, Smith
Federal income tax concepts applicable to corporations, partnerships, estates, and trusts; tax research and planning. Prerequisite: Acct 161. (Spring)

171 **Auditing** (3) Kurtz
Principles and procedures of auditing: generally accepted auditing standards, internal control, audit objectives and reports, audit evidence, professional and legal responsibility, and audit of E.D.P. systems. Prerequisite: Acct 121 and senior status. (Fall)

181 **Accounting Systems** (3) Staff
Data processing considerations in the design and operation of accounting systems. Principles of internal control applicable to manual and automated accounting systems. Prerequisite: Acct 101, 121, and senior status (Fall)

190 **Special Topics in Accounting** (3) Staff
Experimental offering, new course topics and teaching methods. Prerequisite: Department approval.

191 **Advanced Accounting** (3) Mastro
Application of accounting theory to special areas: consolidated statements, business combinations, earnings per share, foreign exchange, price-level adjusted statements, source and application of funds. Prerequisite: Acct 121 and junior status. (Spring)

193 **Business Budgeting** (3) Park
Principles and procedures in the development, installation, and operation of a system of budgetary control to aid management. Prerequisite: Acct 51–52. Students who have received credit for Acct 101 cannot receive credit for Acct 193. (Fall and spring)

199 **Accounting Practice Internship** (3) Gallagher
Concepts, procedures, and standards of auditing practice obtained as an intern with a firm or agency. Prerequisite: 15 semester hours of accounting courses (including a course in auditing), senior status, and approval of the chairman of the department. (Spring)

Third Group

201 **Financial Accounting** (3) Kurtz
The role of accounting in the decision-making process of external parties; the understanding, interpretation, and implementation of financial accounting. (Course equivalent: a similar graduate financial accounting course, or Acct 51–52, or two similar undergraduate courses.) (Fall and spring)

202 **Management Accounting** (3) Park
(Formerly Acct 220)
The role of accounting in the decision-making processes of management; understanding of how accounting influences resource allocation decisions in the organization. Prerequisite: Acct 201. (Fall and spring)

211 **Business Law for Accountants** (3) Moersen
A study of the legal process and of the principles and precepts of business law; corporations, partnerships, property, trusts, wills, and the legal liability of the accountant. (Fall)

221 **Cost and Budget Analysis** (3) Sheldon
A cost accounting course with emphasis on comparative costs, quantitative techniques in cost analysis, managerial accounting reporting systems, and budgeting control systems. Prerequisite: Acct 201 and 202. (Spring)

225 **Financial Reporting Standards** (3) Segel
(Formerly Accounting Theory)
A critical understanding of the Financial Accounting Standards Board Pronouncements (Standards) and the Security and Exchange Commission–Accounting Series Releases. Prerequisite: Acct 201 and 202. (Fall and spring)

242 **Business Income Taxation** (3) Gallagher
Federal tax concepts applicable to individuals, partnerships, fiduciaries, and corporations; emphasis on recognition of tax consequences attached to common business transactions and on tax planning. Not open to Master of Accountancy candidates. (Fall and spring)

251 **Accounting for Multinational Corporations** (3) Hilmy
A study of international accounting standards with emphasis on accounting for foreign conversion requirements compatible with domestic accounting consolidation standards. Prerequisite: Acct 201. (Fall)

255 **Business Combinations and Not-for-Profit Organizations** (3) Hilmy
(Formerly Consolidations)
Corporate concepts, business combination policies, including FASB, SEC, AICPA business combination pronouncements. Structure analysis of combined and consolidated financial statements; accounting for not-for-profit and governmental organizations. Prerequisite or concurrent registration: Acct 225. (Fall)

260 **Tax Research and Planning** (3) Gallagher, Smith
A study of the legislative, administrative, and judicial sources of federal tax law. Emphasis on the use of tax research tools in locating, interpreting, and communicating tax law and on the complementary relationship between legal research and quantitative decision making. (Fall)

261 **Federal Income Taxation** (3) Gallagher
A study of federal income taxation, covering gross income, deductions and credits, sales and other disposition of property, capital gains and losses, and timing. (Fall and spring)

262 **Federal Income Taxation of Partnerships and S Corporations** (3) Crimm
Federal income taxation of partnerships; formation, operation, distribution, and transfer of partnership interests. Prerequisite: Acct 261. (Spring)

263 **Federal Income Taxation of Corporations** (3) Gallagher
A study of federal income taxation of corporations, covering capital structure, distributions not in and in complete liquidation, and corporate accumulations. Prerequisite or concurrent registration: Acct 261. (Spring)

264 **Federal Taxation of Estates and Gifts** (3) Gallagher
A study of estates, gifts, and trusts covering gross estates, state transfer taxes, valuation problems, planning estate liquidity, complex trusts. Prerequisite: Acct 261. (Spring)

265 **Tax Practice and Procedure** (3) Smith, Gallagher
A study of federal tax practice and procedure, including organization of the IRS, ethical responsibilities, statute of limitations, examination of returns, claims for refund, penalties, and tax rulings. Prerequisite or concurrent registration: Acct 261. (Fall)

266 **Corporate Reorganizations and Affiliations** (3) Smith, Gallagher
Advanced study of corporate taxation: corporate reorganizations, multiple corporations, consolidated returns, and carryover of tax attributes. Prerequisite: Acct 263. (Fall)

267 **Estate Planning** (3) Gallagher, Smith
Selected studies in estate and financial planning, with emphasis on estate, gift, and income tax considerations. Prerequisite: Acct 264. (Fall)

268 **Deferred Compensation** (3) Staff
A study of tax aspects of deferred compensation arrangements, including qualified pension, profit-sharing, and stock bonus plans; retirement plans for self-employed individuals; individual retirement accounts; and stock options. Prerequisite or concurrent registration: Acct 261. (Fall)

275 **Contemporary Auditing Theory** (3) Kurtz
Study of advanced independent (external) and internal auditing concepts including operational auditing; application of statistical sampling to auditing, audit of electronic data processing systems, computer applications, ethics. Prerequisite: Acct 225. (Spring)

276 **Management Planning and Control** (3) Paik
Integrative case study approach to management systems for planning, control, and decisions; value indices for organizational subunits, transfer pricing, contemporary control systems, accounting framework and cycle. Prerequisite: Acct 202. (Spring)

277 **Accounting and Decision Systems** (3) Paik
Accounting as a basis for economic decision making by management and investors. Prerequisite: Acct 202. (Fall)

282 **Accounting Information Systems and EDP** (3) Staff
Development and application of accounting system theory, including analysis, design, and implementation. Integration of electronic data processing, accounting systems, and management information systems. Prerequisite: Acct 201. (Fall)

290 **Special Topics in Accounting** (3) Staff
Experimental offering; new course topics and teaching methods. May be repeated once for credit.

297 **Professional Accountancy and Business/Government Policy** (3) Staff
A study of the development process of professional accounting standards through examination of the socioeconomic, political, legal, and management process. Management policy concerns for alternatives in the selection of accounting standards. Prerequisite: Master of Accountancy or Master of Taxation status. (Spring)

298 **Directed Readings and Research in Accounting** (3) Mastro and Staff

Fourth Group

Fourth-group courses are primarily for doctoral students and are offered as the demand requires. The courses are open to other graduate students at the discretion of the department.

311–12 **Seminar: Public–Private Sector Institutions and Relationships** (3–3) Staff
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

391 **Doctoral Seminar in Accounting** (arr.) Sheldon
Reasoning and research in technical areas of accounting: theoretical issues and their application to practice; conceptual themes in professional literature; comparative accounting research analyses. (Fall and spring)

398 **Advanced Reading and Research** (arr.) Mastro and Staff
Limited to students preparing for the Doctor of Business Administration or Doctor of Public Administration general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Business Administration or Doctor of Public Administration candidates. May be repeated for credit. (Fall and spring)

ADMINISTRATIVE SCIENCES—GRADUATE PROGRAM

Academic Committee: J. Zeidner *(Director)*, K.E. Klenke-Hamel, J.N. Mosél, P. Wirtz

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degree of Master of Arts in the field of administrative sciences. The program has been designed for government and business professionals who wish to increase their administrative competence and career potential. It provides knowledge and skills in the social, behavioral, quantitative, and information sciences.

Master of Arts in the field of administrative sciences—Prerequisite: a bachelor's degree with a B average from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 36 semester hours of course work. There is no thesis or tool requirement. AdSc 221, Econ 211 and 217, Psyc 244, and Stat 104 constitute the core curriculum. A student may specialize in Management Information Systems, Human Resources Management, or Applied Organizational Behavior. The Management Information Systems track requires AdSc 201, 202, 203, 204, 205, 218, and 219. The Human Resources Management track requires AdSc 210, 211, 213, 214, 217, and 220, and Econ 243. The requirements for the Applied Organizational Behavior track are Psyc 245, 246, 250, 260; Soc 241; AdSc 215 and 216. All students must pass a Master's Comprehensive Examination.

201 **Principles of Management Information Systems** (3)
Examination of fundamental issues associated with information systems. The evolution of the "system perspective" from general systems theory. Contemporary information systems as a function of four generations of system analysis techniques. Design and optimization of existing structures and tools for analyzing need for information systems in an organization.

202 **Management Information Technology I** (3)
Principles of design, implementation, evaluation, and modification of management information systems. Emphasis on hardware and software configuration, design strategies and alternatives, and analytical techniques. Introduction to operating systems, control languages, assembler machine languages, and high-level programming languages. Students will prepare and test several programs.

203 **Management Information Technology II** (3)
Advanced concepts in analysis and development of computer-based information systems. Networks; high-level data structures; effective utilization and management of storage (including "garbage collection" techniques); input/output interfacing strategies; development of telecommunication protocols; principles of performance evaluation and optimization; hardware/software interfaces.

204 **Management Information Systems Development** (3)
Synthesis of organizational and technological aspects of development of information systems. Students will design, develop, implement, and test a computerized management information system. Emphasis on needs assessment, organizational structures as they reflect varying requirements for an information system, and comprehensive evaluation techniques.

205 **Decision Support Systems** (3)
Comparison of existing techniques and tools for assisting management in the decision-making process. Overview of alternative approaches to the management of information and the comparative costs and benefits of each. Analysis of the frameworks with which to organize and synthesize the decision-making process. Hardware and software limitations of alternative approaches.

210 **Employment Testing: Practices, Policies, and Controversies** (3)
The seminar will explore the theory, use, and utility of current quantitative assessment techniques in the work setting. An examination will be made of employment testing and the kinds of criticisms levied against such testing. The social and policy implications, adverse impact, and legal constraints in test use will also be analyzed. Testing in industry, government, and the military and for licensing purposes will be highlighted.

211 **Psychology of Public Personnel Administration** (3)
The seminar will examine the psychological theory and techniques underlying such personnel functions as selection, training, personnel evaluation, systems evaluation, and labor relations. The impact of the electronic information revolution on management practices, jobs, and individual incentives also will be analyzed. An assessment will be made of the new federal performance-based evaluation system, including the Merit Pay and Senior Executive Systems.

212 **Administrative Systems: Theory and Practice** (3)
Examination of significant administrative functions within an integrated systems framework of the employee, the organization, and society. Emphasis on operational problems and strategic planning. Typical areas include needs assessment, goal setting, resource development, labor–management relations, comparable worth, and the law and personnel management.

213 **Managerial Leadership, Motivation, and Work** (3)
Examination of managerial behavior and skills in such areas as contract management, group and personal interactions, supervisor–subordinate relationships, conflict management, and labor negotiations. Analysis of relationships of the manager's leadership style, experience, and capabilities to theories of leadership and motivation.

214 **Personnel Training and Performance Appraisal Systems** (3)
Training and appraisal of employees for improved productivity. Training topics include development of management training programs, microelectronics applications, and techniques for aiding decision-making skills. Appraisal topics include obtaining dependable criteria, performance measurements, and comparison of merit rating systems.

215 **Current Issues in Sociotechnical Systems and Organizational Design** (3)
Sociotechnical systems provide a basis for examining the effects on performance of organizational factors. Topics include design approaches emanating from Europe, Japan, and the U.S.; comparisons of selected job and organizational design approaches, drawing heavily on systems theory with direct

focus on the design of the work place; and the interrelations among jobs, moving toward broader organizational design issues.

216 **Theories and Management of Planned Change** (3)
Examination of theories of planned changes of individuals, groups, and organizations, including diffusion of innovation. Perspectives on change include cognitive input, modeling and limitation, participation involvement, expectancy, selective reinforcement, and structural rearrangement.

217 **Productivity and Human Performance** (3)
Definitions and measurement of productivity for individuals, teams, and organizations and for jobs that vary from highly structured to unstructured. Techniques that enhance productivity, including job design, training, and motivation. The roles of labor and management in achieving greater productivity.

218 **Design of User-Friendly Interfaces** (3)
Topics include design of interfaces for interactive terminal systems, including dialogue and graphic systems. Analysis of psychological, human engineering, cognitive, linguistic, perceptual, and memory factors.

219 **Information Policy and Law** (3)
Topics of current interest in information policy, including privacy in data bases, freedom of information, antitrust, and other business implications of policies. Analysis of cross-cultural implications, computer infringement of copyrights, and protection of property rights in software.

220 **Organizational Decision Making** (3)
The processes of organizational decision making, the state of theory; research and applications for the practicing manager. Topics include methods and models, problem discovery and diagnosis, search for the design of solutions, evaluation and choice, dealing with conflict, constraints on decision process, and decision aids and support systems. Overview of statistical inference and utility theory. Individual, team, and organizational decision making.

221 **Introduction to Computers, Programming, and Information Systems** (3)
Introductory concepts in computer hardware, software, and management information systems. Organizational and technological factors providing the framework for decision support systems. Fundamental principles underlying information systems technology, including needs assessment and performance evaluation strategies. Emphasis on high-level computer languages (particularly PL/1), with primary focus on alternative implementation strategies.

AMERICAN STUDIES PROGRAM

Professors R.H. Walker, Jr., C.C. Mondale, B.M. Mergen (*Director*)
Adjunct Professor F. Gutheim
Professorial Lecturers L. Miller, W.E. Washburn
Associate Professors J.O. Horton, H.F. Gillette, Jr., J.M. Vlach, R.W. Longstreth, M.S. Shapiro
Associate Professorial Lecturer C.R. Field
Assistant Professor P.M. Palmer
Adjunct Assistant Professor P.J. Cressey
Assistant Professorial Lecturer B.G. Carson

Affiliated Programs
Library of Congress
Smithsonian Institution

Faculty Advisory Committee
C.C. Mondale (*Chairman*), C.J. Deering, F.S. Grubar, R.L. Humphrey, J. Moreno, O. Seavey, R.P. Sharkey, R.W. Stephens, D.D. Wallace, Jr., A.M. Yezer

American Studies Council
The Council serves the American Studies Program in an advisory capacity. It includes representatives from the student body, the Washington community, the faculty, alumni, and affiliated programs.

Bachelor of Arts with a major in American civilization (field-of-study)—The following requirements must be fulfilled.

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite course—AmCv 71–72. Other introductory courses as needed for upper-division courses in a discipline as described below.
3. An American studies core in the following courses: Hist 171–72; AmCv Hist 771, 772, U.S. Intellectual History; 6 hours chosen from AmCv Engl 161–62–63, 12 hours of upper-division courses in a discipline or theme chosen so as to provide a structured approach to the range of American civilization (accepted approaches include anthropology, sociology, economics, history, literature, history of art and architecture, political science, philosophy, religion), and AmCv 179–80, which must be taken in the last full year of residence in preparation for the comprehensive examination that covers the required courses and special discipline or theme.

Special Honors will be awarded to students who fulfill the requirements for the major with a grade point average of 3.5 or better in the required courses and 3.0 or better overall and who receive honors on the comprehensive examination.

At least two years of a foreign language and knowledge of statistics and computer programming in the humanities and social sciences is strongly recommended. Students must consult at least once a semester with their American studies advisor.

Master of Arts in the field of American civilization—Prerequisite: the degree of Bachelor of Arts in American civilization or a related field.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) AmCv 271–72; (2) 18 semester hours chosen in a carefully related pattern of study of American civilization; (3) a comprehensive examination covering general competence in American civilization and the candidate's area of concentration; (4) a thesis (6 semester hours) written on a topic approved by the student's advisor. Special options in the master's degree program include the following:

1. *A concentration in material culture*—Course emphasis on the use of artifacts in historical research in association with the Smithsonian Institution. Required in addition to the general requirements outlined above, AmCv 250. Recommended: courses in decorative arts, architectural history, historical archaeology, history of technology, and history of art.

2. *A concentration in historic preservation*—Course emphasis on interpreting issues in historic preservation through a humanistic framework. Prerequisite: a course in architectural history. Required: in addition to the general requirements outlined above, 36 semester hours, including 12 hours of courses recommended by the departmental advisor (including AmCv 271–72), AmCv 277–78, 12 hours recommended by the director of the historic preservation program, 6 hours of thesis supervision.

3. *A concentration in folklife*—Course emphasis on the expressive culture of American folk societies and theories and methods for its evaluation and interpretation. Required: in addition to the general requirements outlined above, AmCv 254, 257. Strongly recommended: additional course work on topics related to folklife, such as regionalism, oral history, material culture, vernacular architecture, and social and cultural history.

Master of Arts in the field of museum studies, see Museum Studies.

Doctor of Philosophy in the field of American civilization—This program combines work in the humanities and or social sciences as preparation for research and teaching with the option of stressing preparation for museum and library careers. Applicants are required to have an adequate background in the humanities and or social sciences as they apply to the understanding of American civilization.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Candidates must pass a General Examination in four areas within three

calendar years of matriculation. American cultural history is the only required field. Three other fields are elected with approval of the advisory committee, one field must represent foreign coverage. Other areas may be chosen from the following groups: (1) American diplomatic, economic, political, social, or urban history, folklife, literature, art, philosophy, or religion, Afro-American history, historic preservation, or some areas of the social and behavioral sciences, (2) in affiliation with the Library of Congress—supervised historical study in bibliographic resources including American history and politics, cartography, cross-cultural studies, government documents, graphic arts and music, motion pictures and recorded sound, printing and bookmaking; (3) in affiliation with the Smithsonian Institution—supervised studies including aerospace history, decorative arts, ethnohistory, history of science, history of technology, industrial archaeology, material aspects of American civilization, and various fields in the history of art. Additional areas of study may be arranged within the University and in both the Library of Congress and Smithsonian cooperative programs. Special announcements concerning these programs are issued periodically and are available in the office of the Director of the American Studies Program.

Research fields for the dissertation may be chosen from any of the above except those dealing with the culture of an area outside the United States.

First Group

50 **Washington, D.C.: History, Culture, and Politics** (3) — Gillette and Interdisciplinary Team
Introduction to interdisciplinary methods of studying the contemporary city. Major problems of metropolitan life, past and present, analyzed by faculty and community leaders. Emphasis on experiential team projects. Same as Hist/PSc/U&RP 50. (Fall)

71–72 **Introduction to American Civilization** (3–3) — Mondale, Mergen
Themes and issues in American civilization since Colonial times, with emphasis on their contemporary importance. (Academic year)

Second Group

115 **Field Program in Mesoamerican Archaeology and History** (6) — Humphrey, Mergen
Joint offering of the American Studies Program and the Department of Anthropology. Same as Geog 115. Field study in Mexico and Central America. (Summer)

160–61–62 **Studies in American Literature** (3–3–3) — Seavey, Romines, Sten
Same as Engl 160–61–62.

165–66 **Introduction to Folklore** (3–3) — Vlach
History, theory, and methods of folklore. AmCv 165: European and African backgrounds to American folklore. AmCv 166: Folklore and folklife of the United States. Same as Anth 165–66. (Academic year)

167 **Man-Made America: The Old Colonial Scene** (3) — Haskett
Same as Hist 167.

168 **Man-Made America: Views of a New Nation** (3) — Haskett
Same as Hist 168.

173 **Afro-American History** (3) — Horton
Survey of the Afro-American experience, emphasizing the contributions of black Americans to, and their impact upon, American history. Same as Hist 173. (Fall)

174 **Special Topics in Afro-American History** (3) — Horton
Concentration on specific issues central to the Afro-American experience. Consult Spring *Schedule of Classes* for issues to be addressed. Same as Hist 174. (Spring)

175–76 **American Architecture** (3–3) — Longstreth
Examination of selected topics in American architecture from the 17th century to the present. Stylistic properties, form and type characteristics, technological developments, and urbanistic patterns are introduced as a

means of interpretation of historic meaning. Buildings are analyzed both as artifacts and as signifiers of social, cultural, and economic tendencies. U&RP/AmCv 175: 1600–1860; U&RP/AmCv 176: 1860–present. Same as Art 176 and 191. (Academic year)

177 **Introduction to Historic Preservation** (3) Gale
Washington, D.C., will be the primary exhibit for the study of historic preservation as it has developed over the past century. Experience with preservation issues as shown by examples in other localities will also be discussed. Lectures, class discussions of the readings, and field trips to neighborhoods and sites subjected to preservation efforts. Same as U&RP 177. (Spring and summer)

179–80 **Proseminar in American Civilization (3–3)** Mondale
Coordinating course for seniors majoring in American Civilization. (Academic year)

184 **Contemporary American Civilization** (3) Staff
Examination of the patterns of contemporary American life through study of literature, the arts, and political, social, cultural, and economic trends.

185 **History of Women in America** (3) DePauw
Same as Hist 185.

186 **U.S. Urban History** (3) Gillette
History of the American city from colonial foundations to the present, focusing on relationships between social and economic forces with physical form. Special emphasis on transitions from pre-industrial to industrial to metropolitan forms, with attention to implications for public policy and historic preservation. Same as Hist 186. (Fall)

192 **The American Cinema** (3) Mergen
History and criticism of American films. The course will enable the student to recognize and evaluate cinema techniques, to express the evaluation clearly in writing, and to understand the role of films in the context of American culture. Same as Art 192. (Spring and summer)

194 **Introduction to Historical Archaeology** (3) Cressey
Joint offering of the American Studies Program and the Anthropology Department. Survey of the basic data and methods of research in the material culture of recent history. (Spring)

195 **Independent Study** (3) Staff
Open to a limited number of American Civilization majors as directed research or as an internship with a Washington museum or historical society. Approval of advisor required. (Fall and spring)

197 **Oral History and Interview Techniques** (3) Mergen, Gillette
Introduction to theory and practice of obtaining and using historical data through recorded interviews. Examination of major published works in oral history. Particular attention to ongoing oral history projects in the Washington area. Same as Anth/Hist 197. (Fall or spring)

198 **Special Topics in American Studies** (3) Staff
May be repeated for credit provided the topic differs. Admission by permission of instructor.

Third Group

215 **Field Program in Mesoamerican Archaeology and History** (6) Humphrey, Mergen
Joint offering of the American Studies Program and the Department of Anthropology. Field study in Mexico and Central America. (Summer)

225 **History of Washington, D.C.** (3) Gillette
The social history of Washington from village to metropolis, with emphasis through field trips on the evolution of residential neighborhoods and related issues of historic preservation and conservation. Same as Hist 225. (Summer)

254 **Folklore Theory** (3) Vlach
An intellectual history of American folklore research, analysis of particular theories and methods. Same as Anth 254. (Spring)

257 **Seminar: American Folklife** (3) Vlach
Research and discussion on the traditional cultures of various geographical regions of the United States. Theories of regionalism and their relation to the study of folklife and folklore will be considered. Different regions, such as the West, the South, or the Chesapeake, will be emphasized in different semesters. Same as Anth 257. (Fall)

259 **Topics in American Folklife** (3) Staff
A seminar devoted to a variety of subjects related to folklore and folklife, such as public sector folklife policy, folk music, oral literature, or ethnic folklore and culture. The specific topic will be determined by the interests of available faculty and the curriculum needs of the folklife program. May be repeated for credit. Same as Anth 259.

260 **Women in the American Work Force** (3) Palmer
Joint offering of the American Studies Program and the Women's Studies Program. Multidisciplinary historical survey of women's work roles and labor force participation, including social prescriptions for and self-perceptions of women, market and technological factors affecting women's work choices, psychological responses to work roles, and familial organization of work duties. Differential attitudes and experiences by class, race, and ethnic groups. (Spring)

271–72 **Seminar: Scope and Methods in American Studies** (3–3) Gillette, Mondale
Consideration of American studies as an area for research and teaching; introduction to bibliography. Required of candidates for the degree of Master of Arts in the field of American civilization. (Academic year)

274 **International Historic Preservation** (3) Gutheim
Joint offering of the American Studies Program and the Urban and Regional Planning Department. Comparative examination and analysis of international organizations and activities dedicated to the preservation of historical places and cultural traditions. Review of national and multinational policies affecting preservation interests. (Spring)

277–78 **Historic Preservation: Principals and Methods** (3–3) Longstreth
Joint offering of the American Studies Program and the Urban and Regional Planning Department. Same as Hist 277–78. Exploration of scope and purpose of the preservation movement in the United States with focus on developments from the 1960s to the present. Topics covered include the emergence of preservation theories in the 19th century, relationships between attitudes toward the past and toward design, the intent and impact of legislation, organizational dynamics, approaches to documentation, the concept of significance, and preservation as an instrument of change. Discussions with representatives of organizations and public agencies supplement class lectures. (Academic year)

289–90 **Seminar: Topics in American Civilization** (3–3) Staff
Research problems selected by the instructor. Preparation in American cultural history or other area appropriate to the topic of the seminar. (Academic year)

294 **Field and Laboratory Research in Archaeology** (3) Cressey
Joint offering of the American Studies Program and the Anthropology Department. Field and/or laboratory techniques and interpretation. Topics may include excavation methods, recording, photography, preservation, stratigraphy and environmental reconstruction, typology, use-wear analysis, and spatial analyses. Specific research area and topics announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

295 **Independent Study** (arr.) Staff
Limited to master's candidates. Written permission of instructor required. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

351 **Vernacular Architecture** (3) Staff
Examination of selected regional and ethnic traditions in American building. Survey and field techniques, comparative study of related types of objects, and use of documentary sources. (Spring)

379–80 **Readings in American Cultural History** (3–3) Walker
For students preparing for the Doctor of Philosophy general examination in the field of American civilization. (Academic year)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

COURSES OFFERED IN AFFILIATION WITH THE LIBRARY OF CONGRESS

The Graduate School of Arts and Sciences is affiliated with the Library of Congress in a program leading to the degree of Doctor of Philosophy. The following courses are offered at the Library of Congress by members of its staff.

Third Group

255–56 **Research Orientation Seminar: Americana in the Library of Congress** (3–3) Walker
Examination of major themes in American civilization as they relate to the collections of the Library of Congress. Full-year course with direct exposure to Library staff and materials. May be taken either as a conventional seminar culminating in a research paper or as preparation for a doctoral reading field. "Research Materials for the Study of American Life: Their Content, Collection, Arrangement, and Use." (Alternate academic years)

Fourth Group

355–56 **Practicum: Advanced Library Research** (3–3)
Practical problems in control of library materials with emphasis on collections in the Library of Congress. A reading field in the affiliated program. Prerequisite: AmCv 255–56. (Academic year)

389 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination in fields offered in affiliation with the Library of Congress. May be repeated for credit. (Fall and spring)

390 **Dissertation Research** (arr.)
For Doctor of Philosophy candidates preparing dissertations based upon or significantly related to collections of the Library of Congress. Supervised by specialists at the Library. Prerequisite: AmCv 355–56. (Fall and spring)

COURSES OFFERED IN AFFILIATION WITH THE SMITHSONIAN INSTITUTION

The Graduate School of Arts and Sciences is affiliated with the Smithsonian Institution's Program for Graduate Students in the History of American Civilization. The following courses are offered at the National Museum of American History and at the National Portrait Gallery by members of their staffs.

Third Group

250 **Orientation Course: Material Aspects of American Civilization** (3) Washburn, Mergen
Familiarization with the historical collections of the Smithsonian Institution and introduction to opportunities for research and publication based on

historical objects. Required of all students in the master's and doctoral programs affiliated with the Smithsonian Institution. (Fall)

251 **Museum Research and Education** (3) Washburn and Staff
Supervised work and or study under the direction of Smithsonian staff members and research associates—museum visitor behavior, costumes and furnishings, decorative arts, and photography as historical documentation. (Fall and spring)

252–53 **American Decorative Arts** (3 -3) Carson
Concepts of visual recognition and evaluation of surviving domestic artifacts from the 17th, 18th, and 19th centuries, including those made of wood, clay, glass, metal, and cloth. AmCv 252 is prerequisite to AmCv 253. (Academic year)

284 **Seminar: Studies in American Art and History** (3) Miller, Field
Joint offering of the American Studies Program and the Art Department. Exploration of selected problems and themes in American cultural history involving the use of artistic materials in different media; emphasis on methodology and analytic techniques. May be repeated for credit.

285 **Technology, Labor, and American Society** (3) Mergen
Selected readings on the interrelations among technology, labor, and society in the United States.

Fourth Group

352 **Research in Selected Aspects of American Civilization** (3)
Supervised study and/or field work in selected subject areas related to the activities of the Smithsonian Institution. (Fall or spring)

394 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination in fields offered in affiliation with the Smithsonian Institution. May be repeated for credit. (Fall and spring)

395 **Dissertation Research** (arr.)
For Doctor of Philosophy candidates preparing dissertations significantly related to the material aspects of American civilization. Students work under curatorial supervision at the Smithsonian Institution. Prerequisite: AmCv 351–52. May be repeated for credit. (Fall and spring)

ANATOMY—DOCTORAL PROGRAM

Professors F.D. Allan, T.N. Johnson, R.S. Snell *(Chairman)*, E.N. Albert, M.J. Koering
Associate Professors K.E. Johnson, F.J. Slaby, R.J. Walsh, K.D. Peusner, J.M. Rosenstein
Assistant Professor R.C. Bohn

Doctor of Philosophy in the field of anatomy—Required: The general requirements stated under the Graduate School of Arts and Sciences. Candidates must also fulfill tool requirements by demonstrating proficiency in two of the following: a language (German, French, or Russian), biostatistics, computer science, or biological instrumentation. There will also be a comprehensive written and oral examination that will cover at least three areas of anatomical studies.

Research fields: cell ultrastructure, embryology, gross anatomy, histology, neuroanatomy, and physical anthropology.

Faculty approval is required for all courses.

202 **Gross Anatomy** (6) Snell and Staff
Regional dissections of adult cadaver supplemented with lectures and x-rays. Laboratory fee: $30. (Fall)

203 **Human Developmental Anatomy** (3) Staff
Origin and development of human body, emphasis on study of human development in interpreting anatomical anomalies. (Fall)

204 **Neuroanatomy** (2) T Johnson
Gross and microscopic anatomy of central nervous system and special senses. Laboratory fee, $13.

205 **Human Microscopic Anatomy** (3) Koering and Staff
Microscopic structure of cells, tissues, and organs of the human body. Laboratory fee, $20. (Fall)

206 **Scanning Electron Microscopy** (2) Koering
Preparative techniques for various biological tissues, operation of scanning electron microscope, and interpretation of micrographs. Laboratory fee, $30. Enrollment limited. Prerequisite or concurrent registration, Anat 260. (Fall)

208 **Comparative Vertebrate Neurology** (1) T Johnson
Survey of the evolution of the vertebrate brain. Prerequisite, Anat 204. Laboratory fee, $10. (Spring)

209 **The Use of Audiovisual Techniques in Anatomy** (2) Allan
Preparation of a significant audiovisual program about some aspect of human anatomy. Laboratory fee, $20. (Spring)

212 **Neurobiology** (3) Staff
An integrated survey of the structure and function of the human nervous system, lecture, clinical demonstration, and laboratory. Same as Phvl 212. Laboratory fee, $25.

221-22 **Seminar** (1–1) Rosenstein
Research reports and discussions of special topics by guest lecturers, staff, and students. (Academic year)

249 **Introduction to Anatomical Research** (1) Staff
Major research techniques as applied to biological materials in the various anatomical disciplines. (Fall)

252 **Physical Anthropology** (1) Staff
Variations in humans and factors affecting them, human evolution and racial differences; anatomy and culture of ancient humans. (Spring)

253 **Brain-Tissue Interactions** (1) Walsh, Rosenstein
Interactions of the central nervous system with the muscular, sensory, and endocrine systems. Student presentations and clinical aspects. Prerequisite, Anat Phvl 212. (Spring)

254 **Fetal Anatomy** (2) Allan
Dissection of midgestational fetus. Comparison of fetal and adult structures. Limited enrollment. Laboratory fee, $10. (Spring)

256 **Teratology** (1) Staff
Introduction to teratologic principles and techniques, with emphasis on experimental design. Limited enrollment.

260 **Electron Microscopy in Cellular Biology—Lecture** (1) Koering
Introduction to the morphology of the cell and its relationship to electron microscopic techniques. (Spring)

261 **Transmission Electron Microscopy** (3) Koering
Introduction to the routine processing of specimens; preparation and interpretation of micrographs. Limited enrollment. Admission by permission of instructor. Prerequisite or concurrent registration, Anat 260. Laboratory fee, $25. (Spring)

262 **Gross Anatomy of Upper and Lower Extremities** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy, discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

264 **Gross Anatomy of Head and Neck** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy, discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

266 **Gross Anatomy of Thorax and Abdomen** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy, discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

268 **Gross Anatomy of Pelvis, Perineum, and Lower Extremity** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

270 **Dissection of the Human Brain** (1) T. Johnson
Dissection of major pathways and nuclei of the brain with consideration of ventricular system; conferences and assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

272 **Autonomic Nervous System** (1) Allan
Development, microscopic and gross anatomy, function of central and peripheral components of autonomic nervous system, with clinical consideration. (Spring)

275 **Advanced Human Embryology** (1) Allan
Microscopic examination of the human embryo at several critical periods during embryogenesis. Limited enrollment. (Spring)

276 **Advanced Studies in Anatomy** (1) Staff
Lectures and conferences on selected anatomical subspecialties—endocrinology, teratology, growth, and others. May be repeated for credit. (Spring)

277 **Special Topics in Neuroanatomy** (3) Bohn, Peusner, Rosenstein, Walsh
Selected topics regarding the structural and functional organization of the nervous system. May be repeated for credit. (Spring—alternate years)

288 **Surface Anatomy and Radiology** (1) Snell
Lectures and demonstrations on areas of clinical importance. (Spring)

289 **Biochemical and Morphological Techniques in Cell Biology** (3) Slaby
The application of biochemical and electron micrographic techniques used in cell biology research. Limited enrollment.

295 **Research** (arr.) Staff
Content differs each time course is offered; may be repeated once for credit. Fee to be arranged. (Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ANTHROPOLOGY

Professors R.K. Lewis *(Emeritus)*, R.M. Krulfeld *(Chairman)*, R.L. Humphrey, Jr.
Professorial Lecturers J.L. Angel, A. Franklin
Associate Professors V.K. Golla, S.L. Simons, A.S. Brooks, J.M. Vlach, C.J. Allen
Adjunct Associate Professor C.R. Rose
Associate Professorial Lecturers S. Hertz, G. Teleki, Jr., D. Von Endt, J.J. Hourihan
Adjunct Assistant Professor P.J. Cressey
Assistant Professorial Lecturers R.O. Selig, R.K. Evans
Lecturer A.G. Webster

Bachelor of Arts with a major in anthropology (departmental).—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite course—Anth 1–2.
3. Required courses in other areas—(a) 12 semester hours, or equivalent, of introductory French, German, Russian, or Spanish or another major language approved by the Anthropology Department; (b) 6–12 semester hours of course work as related departments. Recommended for archeological emphasis are courses in economics, political science, psychology, and sociology; for archeological emphasis, courses in American civilization, art history, geography and regional science, geology, and history; for emphasis in physical anthropology, courses in anatomy and biological sciences. Courses in philosophy and statistics are strongly recommended for all anthropology majors.

4. Requirements for the major—24–36 semester hours in second-group anthropology courses, including Anth 101 and at least one course from each of the following four categories: aspects of culture (courses numbered in the 150s), linguistics (161, 162, 168, or 169), ethnology (courses numbered in the 170s), and physical anthropology or archaeology (courses numbered in the 180s). Students intending to pursue a graduate degree in anthropology should take Anth 157 and at least one course each in archaeology and physical anthropology. Qualified seniors may enroll in 200-level courses with the permission of the instructor. Up to 6 semester hours of ethnographic or archaeological field school credit may be accepted and applied toward the major, if approved by the department, and majors are encouraged to participate in such summer programs. Opportunities also exist for field and laboratory research during the academic year, both within the department and elsewhere in the Washington area. Credit for such work (not to exceed one-quarter of the student's total second-group credit hours in anthropology) may be granted through registration in Anth 195. Seniors in anthropology are urged to enroll in Anth 198, Senior Seminar; candidates for graduation with Special Honors must register in Anth 198 or for 3 semester hours of Anth 195, Undergraduate Research, and write a paper of special distinction arising out of a program of directed reading or research.

Bachelor of Arts with a major in classical archaeology and anthropology (departmental)—An interdepartmental major offered by the Anthropology and Art Departments. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult a departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the natural and mathematical sciences.)

2. Required courses in other areas: 6 semester hours, or equivalent, of introductory French, German, Latin, Greek, or a Near Eastern language. A second year of language study is strongly encouraged. Since graduate study in archaeology usually involves broader preparation, especially in languages, students intending to pursue graduate study should consult with the departmental advisor as early as possible in their undergraduate programs.

3. Required courses in the major: Anth 180, 183, 184, and one course chosen from Anth 152, 158, 177, or an approved 3-hour course in field work; four courses chosen from Art 101, 102, 103, 112, 155; two courses chosen from Clas 71, 72, 108, 113, 170; two courses chosen from Hist 107, 108, 109, 110 (students electing Hist 108 should previously have completed Hist 107 or 109).

Minor in general anthropology—21 credit hours are required, including Anth 1–2, 101, and four additional semester courses in anthropology, no more than two of which may be taken in the same subdiscipline. (For the purposes of this minor, the department's second-group courses may be divided into subdisciplines as follows: biological anthropology—Anth 186, 187, and 188; archaeology—Anth 180, 182, 183, 184, 185, 190, and 194; anthropological linguistics—Anth 161, 162, 168, and 169; sociocultural anthropology—all other second-group courses, with the exception of Anth 195, 196, and 198, in which the topic is variable.)

Minor in archaeology—18 credit hours are required, including Anth 1 and 180, three courses chosen from Anth 182, 183, 184, 185, 190, and 194, an approved field or research course or a fourth course chosen from the preceding list.

Minor in biological anthropology—15–18 credit hours are required, including Anth 1, 186, 187, and 188, an approved field or research course or an approved course or course sequence in a related field (including biological sciences, geology, psychology, statistics, and certain other disciplines).

Minor in sociocultural anthropology—18 credit hours are required, including Anth 2 and 101, one course in ethnography (Anth 170–179), Anth 151 or 152, Anth 156 or 157, one course chosen from Anth 150, 153, 155, 158, or 159.

Minor in cross-cultural communication—18 credit hours are required, including Anth 2, 161, 162, Anth 150 or 159, one course in ethnography (Anth 170–179), one course chosen from Anth 153, 155, 158, 163, 165, or 168. Psyc 115 is recommended.

Master of Arts in the field of anthropology—Prerequisite: a bachelor's degree, a major in anthropology is preferred but not mandatory. The undergraduate program should have included courses above the introductory level in anthropological theory, social organization, linguistics, archaeology, and physical anthropology. Students with less background in anthropology may be admitted but may be required to take one or more undergraduate courses to make up deficiencies before beginning the degree program.

1. *General degree*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The minimum requirement consists of 24 semester hours of approved graduate course work, plus a thesis (equivalent to 6 semester hours). A thesis is preferred; under certain circumstances, however, the department may permit a program of study consisting of 36 semester hours of approved course work without a thesis. At least 6 semester hours drawn from the sequence Anth 201, 202, 203, 204 should be included in the program of study and should be completed during the first 24 semester hours of graduate course work. A reading knowledge examination in a major foreign language must be passed before beginning the third semester of graduate work. A tool course in statistics, computer programming, remote sensing, or a similar technical field may be substituted for the foreign language reading examination, if approved by the department. A written general Master's Comprehensive Examination must be passed before beginning the 28th semester hour of graduate work.

2. *With a concentration in museum training*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study is the same as that described for the general degree, above, with the following exceptions: the minimum requirement consists of 36 semester hours of approved graduate course work and must include from 12 to 15 semester hours of work in museum-related courses, 6 semester hours of which may be in an internship. In addition to the tool options described above, museum training students may substitute for the foreign language reading examination an appropriate course in chemistry or photography, if approved by the department. No thesis is required, but students are expected to submit to the department at least one research paper of publishable quality on a museum-related topic. Students whose primary interest is in museum techniques, rather than anthropology, are advised to apply to the master's program in museum studies (see Museum Studies).

3. *With a concentration in development*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study is the same as that described for the general degree, with the following exceptions: this is a 36-credit-hour nonthesis program, including 6–9 hours in development anthropology (Anth 220, 221, 222), 18–21 hours in other anthropology courses, and 6–9 hours in economics and economic development. In some circumstances a thesis may be allowed. The program is designed to improve the student's understanding of complex development problems, such as economic change, population, health, education, migration, and ecology, within an anthropological framework. A limited number of internships will be available at public and private development agencies in the Washington area.

4. *With a concentration in folklife*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study is the same as that described for the general degree, with the following exceptions: this is a 30-credit-hour thesis program consisting of 24 hours of anthropology, including 6 hours of folklore core courses (Anth AmCv 254 and 257). In some circumstances a 36-credit-hour nonthesis program may be allowed.

Course accessibility: Anth 115, 152, 161, 162, 165–66, 168, 169, 180, 182, 185, and 215 may be taken without anthropology course prerequisites. Anth 1 is prerequisite to Anth 186, 187, and 188. Anth 1 or 180 is prerequisite to Anth 183–84. Anth 1 and 2 are prerequisite to Anth 101. Anth 2 or the permission of the instructor is required for all other second-group courses.

First Group

1–2 **Introductory Anthropology** (3–3) Staff
Anth 1: survey of human origins, physical evolution, and culture history. Anth 2: survey of the world's cultures, illustrating the principles of cultural behavior. Anth 1 and 2—fall and spring.

Second Group

101 **Survey of Anthropological Theory** (3) Allen, Krulfeld, Golla
The development of anthropological thought as seen in historical context. Exploration of selected basic concepts and theories of contemporary anthropology. (Fall)

115 **Field Program in Mesoamerican Archaeology and History** (6) Humphrey, Mergen
Joint offering of the American Studies Program and the Department of Anthropology. Same as Geog 115. Field study of archaeological and historical sites in Mexico and Central America. (Summer)

150 **Comparative Value Systems** (3) Krulfeld
World views, conceptual systems, and value orientations of representative cultures throughout the world.

151 **Cross-Cultural Survey of Economic Systems** (3) Krulfeld
Comparative study of various economic organizations, including hunters and gatherers, herders, and cultivators. (Fall, odd years)

152 **Man, Culture, and Environment** (3) Humphrey
Basic principles of cultural ecology. Human interaction with the ecosystem both past and present; emphasis on the application of anthropological precepts to current environmental problems.

153 **Psychological Anthropology** (3) Simons
Relevance of psychological theories to human evolution and the cross-cultural study of personality. Cultural determinants of personality formation and mental health. (Spring)

155 **Religion, Myth, and Magic** (3) Simons, Allen
Theories of religion developed by anthropologists; survey of world religions with emphasis on preliterate societies; religious processes and change. Same as Rel 155. (Spring)

156 **Comparative Political and Legal Systems** (3) Hertz, Simons
Comparative analysis of political systems, including bands, tribes, chiefdoms, and states; political processes such as factionalism, styles of leadership, and political ritual; primitive warfare; law. (Spring)

157 **Comparative Kinship and Social Structure** (3) Simons, Hertz, Allen
Comparative analysis of social patterns and roles in kinship and economic and political organization. Emphasis on preliterate societies. (Fall)

158 **Art and Culture** (3) Krulfeld, Humphrey, Allen
The art of tribal society, including the role of art in culture, influences upon the artist, and beliefs and practices associated with art production. (Fall)

159 **Symbol, Cognition, and Society** (3) Allen
The study of culture through the analysis of symbolic systems including myth, cosmology, folklore, art, ritual, political symbolism, and the symbolic study of kinship. (Fall, odd years)

161 **Language and Culture** (3) Golla
Varieties of linguistic structure; the interrelationship of language and culture; the origin and evolution of human language, cultural and social implications of literacy. (Fall)

162 **Language and Society** (3) Golla
Linguistic variation and change; social and political correlates of linguistic differences; language in history. (Spring)

163 **Anthropology of Visual Communication** (3) Staff
Still and motion-picture photography as an integral aspect of anthropological research. A study of recent and historic ethnographic films and an introduction to the forms and methods of making visual ethnographic records. Material fee, $15.

165–66 **Introduction to Folklore** (3–3) Vlach
History, theory, and methods of folklore. Anth 165: European and African backgrounds to American folklore. Anth 166: Folklore and folklife of the United States. Same as AmCv 165–66. (Academic year)

168 **Methods of Linguistic Analysis** (3) Golla
Phonetics, grammatical analysis, principles of lexicography, techniques of linguistic reconstruction, and other tools of anthropological linguistic research. (Fall)

169 **Intensive Study of a Language** (3) Golla
Analytic study of a selected language, ordinarily one not frequently studied in a university context (such as an American Indian language), as an illustration of the methods of anthropological linguistics. Prerequisite: Anth 168. (Spring or summer)

170 **Cultures of the Caribbean** (3) Lewis
Culture history and ways of life among the area's various cultural groups up to the ethnographic present. (Summer)

171 **Native Peoples of North America** (3) Simons, Humphrey
Comparative study of Indian groups representative of each of the continent's culture areas. (Fall)

172 **Cultures of South America** (3) Allen
Comparative study of native American, Iberian, and African cultures of South America and their interactions. Emphasis on world view, interethnic relations, and culture change. (Fall)

173 **Cultures of the Pacific** (3) Lewis
Culture history and ways of life among native peoples of Melanesia, Micronesia, and Polynesia. (Fall, odd years)

175 **Topics in Asian and Circumpolar Ethnography** (3) Humphrey, Krulfeld, and Staff
Intensive, integrated study of a selected culture area in or around Asia (including Circumpolar regions). Specific area to be announced in the *Schedule of Classes*. May be repeated for credit.

177 **Cultures of the Near East** (3) Lewis
Geographic environment, language, religion, and social structure of settled and nomadic peoples of the Near East; emphasis on the Arab world. (Spring)

178 **Cultures of Africa** (3) Lewis, Hertz
Comparative examination of the history, cultural development, and contemporary problems of sub-Saharan African cultures.

180 **General Archaeology** (3) Humphrey, Brooks, Evans
Field and laboratory methodology in archaeology: stratigraphy, dating techniques, chronological systems and their implications; a brief survey of world prehistory.

182 **New World Archaeology** (3) Humphrey
Introduction to archaeological methodology and theory; survey of North American culture history from human entry into the Americas during the Pleistocene period until the time of the first European contacts. (Spring)

183–84 **Old World Prehistory** (3–3) Brooks, Evans
Survey of human prehistory in Europe, Africa, and Asia from the earliest hominid cultures to the beginnings of advanced civilizations. Anth 183: Paleolithic and Mesolithic cultures. Anth 184: Neolithic and Bronze Age cultures. (Academic year)

185 **Latin American Archaeology** (3) Humphrey, Allen
Culture history of pre-Columbian Latin America from the Paleo-Indian period through the Spanish Conquest. Focus on Andean South America in even years, on Mesoamerica in odd years. May be repeated for credit.

186 **Physical Anthropology of Modern Man** (3) Angel
Individual and social biology, methods, and techniques. Genetic, cultural, and ecologic backgrounds of individual and population variation: microevolution, growth, paleodemography, paleopathology, forensic identification techniques. (Spring)

187 **Introduction to Hominid Evolution** (3) Brooks
The fossil record of hominid evolution considered in the light of evolutionary

theory. Brief review of the earlier human antecedents, with concentration on the Pleistocene remains. (Spring, even years)

188 **Primatology** (3) Brooks, Teleki
Physical and behavioral characteristics of the various primate groups and their relationship to human physical and cultural evolution. Frequent meetings at the National Zoological Park. (Fall)

190 **Ethnohistory** (3) Allen, Humphrey
Reconstruction of the history of a selected preliterate society through the analysis of historical documents, oral traditions, archaeological remains, and other indirect sources. Specific topic to be announced in the *Schedule of Classes*. Same as Hist 190.

191 **Anthropology, Drama, and the Human Experience** (3) Garner, Allen
A comparative approach to the meaning of humanity in different cultural traditions. Examination of the role of drama in daily life in its secular and ritual forms and contexts in which it is developed for conscious goals. Through improvisation workshops, students explore how the techniques of anthropology and drama can lead to a better understanding of the significance of specific actions and events and of human experience. Offered jointly with the Communication and Theatre Department.

194 **Introduction to Historical Archaeology** (3) Cressey
Joint offering of the American Studies Program and the Anthropology Department. Survey of the basic data and methods of research in the material culture of recent history. (Spring)

195 **Undergraduate Research** (arr.) Staff
Individual research problems to be arranged with a member of the faculty. May be repeated for credit.

196 **Special Topics in Anthropology** (3) Staff
Courses offered by visiting faculty; experimental offerings. Topic to be announced in the *Schedule of Classes*. May be repeated for credit.

197 **Oral History and Interview Techniques** (3) Mergen
Same as AmCv/Hist 197.

198 **Senior Seminar** (3)
Study and discussion of selected major works in anthropology. Prerequisite: Anth 101 and senior standing in anthropology.

199 **Techniques of Field Research** (3) Staff
Training in the development of skills necessary for different field situations, urban and rural, at home and abroad, in developing techniques of observation, participation, and documentation, as well as skills in handling practical field situations and problems. Intended primarily for those intending to do field research in the United States or abroad but useful to anyone likely to be living or working in a foreign culture.

200 **Methods in Sociocultural Anthropology** (3) Krulfeld
Approaches to library and field research. Conceptual bases and biases in the delineation of problems and in the selection, analysis, and organization of data. Students will design and carry out their own field projects in the Washington area. (Spring)

Third Group

201 **Proseminar: Biological Anthropology** (3) Brooks
Theories, methods, and current issues in the various subdisciplines of biological anthropology. (Spring)

202 **Proseminar: Sociocultural Anthropology** Krulfeld, Simons
Major topics in contemporary social and cultural anthropology, stressing current journal and monograph materials. (Spring)

203 **Proseminar: Anthropological Linguistics** (3) Golla
Contemporary anthropological studies of language in biological, social, and historical perspectives. (Fall)

204 **Proseminar: Method and Theory in Archaeology** (3) Humphrey, Brooks
Survey of the most recent archaeological techniques and theoretical approaches to reconstructing and interpreting the cultures of the past. (Fall)

211 **Seminar: Problems in Conservation** (3) Rose
Joint offering of the Anthropology and Art Departments. Individual conservation projects to determine composition, construction, decomposition of materials, and possible stabilization techniques. Conservation laboratory experience. Prerequisite or concurrent registration: Art or Anth 212. (Fall)

212 **Advanced Conservation Techniques** (3) Von Endt
Joint offering of the Anthropology and Art Departments. Physical structure, molecular biology, and chemistry of ethnographic materials. Chemistry and physics underlying techniques used to conserve these materials. Prerequisite: Art or Anth 293, Chem 50, and permission of instructor. (Fall)

215 **Field Program in Mesoamerican Archaeology and History** (6) Humphrey, Mergen
Joint offering of the American Studies Program and the Department of Anthropology. Field study in Mexico and Central America. (Summer)

220 **The Anthropology of Development** (3) Krulfeld
The role of anthropology in development, including social factors crucial to the understanding and resolution of problems in Third World societies (including rural social systems, ideologies, economic change, ecology, women's roles, nutrition, population, and migration). The potential role of anthropology in planning, feasibility studies, and implementation of development projects. (Fall)

221 **Key Variables in the Development Process** (3) Hourihan, Krulfeld
Major factors required for anthropologists' development work in the areas of population, education, agriculture, irrigation, forestry, nutrition, health care, migration and resettlement, marketing, and communications. Isolation and study of the major variables and processes in each area to aid in successful planning, feasibility study, implementation and evaluation. (Spring)

222 **Issues in Development** (3) Hourihan, Krulfeld
Topic to be announced in the *Schedule of Classes*.

254 **Folklore Theory** (3) Vlach
An intellectual history of American folklore research; analysis of particular theories and methods. Same as AmCv 254. (Spring)

255 **Anthropology, Education, and the Museum** (3) Staff
The role of anthropology in education and museums. Emphasis on current anthropological research and on innovative museum and classroom techniques and materials. Seminars and teaching demonstrations at museums and laboratories.

257 **Seminar: American Folklife** (3) Vlach
Research on and discussion of the traditional cultures of various geographical regions of the United States. Theories of regionalism and their relation to the study of folklife and folklore will be considered. Different regions, such as the West, the South, or the Chesapeake, will be emphasized in different semesters. Same as AmCv 257

258 **Seminar: Anthropology of Art, Aesthetics, and Symbolism** (3) Allen, Krulfeld
Anthropological approaches to aesthetic problems and theories of symbolism in the context of ethnographic materials

259 **Topics in American Folklife** (3) Staff
A seminar devoted to a variety of subjects related to folklore and folklife, such as public-sector folklife policy, folk music, oral literature, or ethnic folklore and culture. The specific topic will be determined by the interests of available faculty and the curriculum needs of the folklife program. Same as AmCv 259.

260 **Seminar: Culture Theory** (3) Krulfeld, Allen
Contemporary theories of culture. Intensive study of major works.

262 **Seminar: Applied Anthropology** (3) Lewis
Use of anthropological methods and techniques in such specific fields as government, community development, land reform, law, and medicine. (Fall)

263 **Seminar: Culture Contact and Change** (3) Simons
Change in Western and non-Western cultures; emphasis on general processes of change and interaction between simpler and more complex societies. (Fall)

264 **Seminar: Anthropological Museum Techniques** (3) Humphrey
Principles of anthropological collection, classification, preservation, identification, interpretation, and exhibition of specimens; research and instructional use of the museum. Field trips to area museums. (Fall)

266 **Seminar: Technology** (3) Humphrey, Lewis
Cross-cultural examination of the form, function, meaning, and use of material culture and the behavior patterns involved in its production. (Spring, odd years)

267 **Seminar: Economic Anthropology** (3) Krulfeld
Comparative study of systems of production, distribution, and consumption, in both preliterate and complex societies. (Fall)

268 **Seminar: Peasant Society** (3) Krulfeld
Cross-cultural analysis of peasant societies, including their manner of functioning within their larger social, economic, and cultural contexts. (Fall)

269 **Seminar: Structural Problems** (3) Simons
Selected topics in social anthropology, including kinship, political, and legal principles of group formation. Emphasis may be given to model building, network analysis, incest, ethnoarchaeology, or other major social concerns. (Spring)

272 **Seminar: Topics in Latin American Anthropology** (3) Allen
Specific topics, to be announced, will be selected from the following: mythology and ritual, artistic traditions, ethnic groups, Andean or Tropical Forest social organization, peasant movements and land reform, native cultures during the Colonial period, archaeological problems.

273 **Seminar: Urban Anthropology** (3) Hertz
A review of the literature on urban kin groups, occupational/class and ethnic communities, migrant adaptations; the nature of urbanism; urban poverty; urban field methods. (Spring)

274 **Seminar: Topics in American Culture** (3) Hertz
Review of anthropological literature on American world view, mainstream and alternate forms of kinship, selected ethnic groups, and the effects of sex, age, class, occupation, and politics on American life. (Fall)

282 **Seminar: Advanced Archaeology—New World Prehistory** (3) Humphrey
Current archaeological problems relating to the origin and development of aboriginal cultures. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit.

283 **Seminar: Topics in Old World Anthropology—Physical Anthropology and Archaeology** (3) Brooks
Current problems in relation to materials from the old world. Specific area to be announced in the *Schedule of Classes*. (Spring)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Same as Econ/Geog/Hist/Span 287 and PSc 285. Interdisciplinary seminar, each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

290 **Advanced Museum Research** (3) Staff
Supervised individual research and/or field work at the Smithsonian Institution or other area museums, arranged in consultation with the museum and the Anthropology Department. Admission by permission of the department chairman. May be repeated for credit. (Fall and spring)

291 **Anthropology in the Museum** (3) Evans
Anthropological materials (in the broadest sense), exhibits, and museums.

Topics include museum anthropology, collections, research, interpretation, and education, with a focus on the practical problems of developing an anthropological exhibit hall. (Spring)

292 **Introduction to Conservation** (3) Rose
Joint offering of the Anthropology and Art Departments. Method and theory of conservation: including fine arts, ethnographic, archaeological, and monuments conservation, handling, restoration, preservation, storage, and display of museum specimens, basic materials of museum objects and the ways they react to their environment. The summer course deals with conservation of archaeological materials. (Fall, spring, and summer)

293 **Preventive Conservation Techniques** (3) Rose
Joint offering of the Anthropology and Art Departments. Practical aspects of preventive conservation, such as monitoring environmental conditions with measuring and recording devices, examining objects and documenting their conditions (including photography), and identifying sources of deterioration for various materials. Students will conduct tests, evaluate exhibition and storage areas, and participate in improving and correcting museum conditions. Prerequisite: Anth Art 292. (Spring)

294 **Field and Laboratory Research in Archaeology** (3) Cressey
Joint offering of the Anthropology Department and the American Studies Program. Field and/or laboratory techniques and interpretation. Topics may include excavation methods, recording, photography, preservation, stratigraphy and environmental reconstruction, typology, use-wear analysis, and spatial analysis. Specific research area and topics announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

295 **Research** (arr.) Staff
May be repeated for credit. (Fall and spring)

298 **Dumbarton Oaks Courses** (arr.)
Courses offered each year by scholars in residence at Dumbarton Oaks, Trustees for Harvard University, are open to qualified graduate and undergraduate students with permission of department chairman. Topics will be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

ART

Professors L.P. Leite *(Emeritus)*, F.S. Grubar, D.H. Teller, L.F. Robinson *(Chairman)*, J.F. Wright, Jr.
Professorial Lecturers Grace Evans, D.A. Brown, L. Miller
Associate Professors H.I. Gates, J.L. Lake, A.H. Smith, T. Ozdogan, D.M. Hitchcock, J.C. Anderson, B. von Barghahn, S.B. Molina, W.T. Woodward, C.C. Costigan
Adjunct Associate Professors Grose Evans, A.D. Ullberg, C.R. Rose
Associate Professorial Lecturers D. Von Endt, D.C. Lynn
Assistant Professors F. Griffith, M.P. Lader, J.L. Stephanic, K.J. Hartswick *(Visiting)*
Assistant Professorial Lecturers E.P. Lawson, K. Montgomery, A.B. Barnhart, C. Smigrod, B.G. Carson, C.R. Smith, M.J. Francis, J.F. Harrop, B.R. Stevens, C.M. Register, R. Schanzer, R. Rodriguez, J. Paradiso, C.S. Rose, W.R. Schran, J. Hillman, M.A. Foresta, M. Sampson, J.D. Morrell, Jr.
Curator, Dimock Gallery L.D. Miller

Bachelor of Arts with a major in art history (departmental).—The following requirements must be fulfilled.

1. The general requirements stated under Columbian College of Arts and Sciences

Students should consult their departmental advisor regarding courses to be taken to satisfy requirements.

2. Prerequisite courses—Art 31–32 and 71 or 72.

3. Required courses in related areas—Art 137; Fren 1–2, 3–4, or Ger 1–2, 3–4.

4. Required courses in the major—Art 101 and 102, 104 or 105, 106 or 107, 108, 109 or 110, 113 or 114, 117 or 118 or 119, 129, 9 additional semester hours in second-group art history courses.

5. A maximum of 9 semester hours in Fine Arts, including Art 137, is permitted.

Graduation with Special Honors. Students must satisfy the general requirements stated under Regulations. They should apply to the chairman of the department at the beginning of their senior year. Before admittance to the program, they must pass a reading examination in either French or German. Upon acceptance, candidates will be assigned to one or more faculty advisors under whose direction they will undertake a supervised program of study.

Bachelor of Arts with a major in Fine Arts (departmental).—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. Students should consult their departmental advisor regarding courses to be taken to satisfy requirements.

2. A total of 51 hours of art courses is required of Fine Arts majors except for students with a concentration in photography, for whom 54 hours are required.

3. Required basic Fine Arts courses: Art 21–22 and 41–42.

4. Required courses in art history: Art 31–32, 6 additional semester hours in second-group art history courses.

5. Required Fine Arts courses in the major:

   a. 12 hours, exclusive of primary area of concentration, in four of the following eight areas—ceramics, advanced drawing, advanced design, printmaking, painting, photography, sculpture, and visual communication.

   b. 15 hours to be taken in the primary area of concentration (except for photography).

   c. 18 hours for students concentrating in photography: Art 23, 24, 181, 182, 205, 206.

6. Nine additional hours of electives may be taken in the Art Department, except for students concentrating in photography, who take only 6 hours of electives in the Art Department.

7. Transfer students must take at least 12 semester hours of second-group Fine Arts courses and 9 semester hours in their area of specialization at this University.

Graduation with Special Honors. Students must satisfy the general requirements stated under Regulations. They should apply in writing to the chairman of the Art Department at the beginning of their senior year. Upon acceptance, each candidate will be assigned one or more faculty advisors under whose direction a project in a special area of interest will be undertaken.

Bachelor of Arts-Master of Arts in the field of art therapy.—A five-year program leading to the B.A. in the field of fine arts or psychology and the M.A. in the field of art therapy. See Art Therapy.

Bachelor of Arts with a major in classical archaeology and anthropology (departmental).—An interdepartmental major offered by the Art and Anthropology Departments. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. Students should consult their departmental advisor regarding courses to satisfy requirements.

2. Required courses in other areas: 6 semester hours, or equivalent, of introductory French, German, Latin, Greek, or a Near Eastern language. A second year of language study is strongly encouraged. Since graduate study in archaeology usually involves broader preparation, especially in languages, students intending to pursue graduate study should consult with the departmental advisor as early as possible.

3. Required courses in the major: Anth 180, 183, 184, and one course chosen from

Anth 152, 158, 177, or an approved 3-hour course in field work; four courses chosen from Art 101, 102, 103, 112, 155; two courses chosen from Clas 71, 72, 108, 113, 170; two courses chosen from Hist 107, 108, 109, 110 (students electing Hist 108 should previously have completed Hist 107 or 109).

Bachelor of Arts with a major in classical archaeology and classics (departmental)—An interdepartmental major offered by the Art and Classics Departments. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. Students should consult their departmental advisor regarding courses to be taken to satisfy the requirements.
2. Prerequisite courses—Clas 1, 2, 3, 4; or Clas 11–12, 13–14.
3. Required courses in the major—Art 101, 102, 112, 155, three courses selected from Hist 107, 108, 109, 110, 209; 6 semester hours in second-group courses in Greek or Latin (a reading knowledge of French and German is recommended).

Master of Arts in the field of art history—Prerequisite, a Bachelor of Arts degree with a major in art history from this University, or an equivalent degree. Applicants from other institutions must present scores on the Graduate Record Examination to the Office of the Graduate School of Arts and Sciences.

1. *With a concentration in classical art and archaeology, medieval art, Renaissance and Baroque art, eighteenth- and nineteenth-century art, contemporary art, or American art*—Required: the general requirements stated under the Graduate School of Arts and Sciences; 36 semester hours of course work including 6 hours of thesis research. As many as possible of the 36 semester hours of course work should be in third-group courses; not more than 6 hours may be taken in museum-related courses. Students must maintain a quality-point index of at least 3.25. A reading knowledge examination in German or French must be passed before completion of the first 9 semester hours of course work. A written general Master's Comprehensive Examination must be passed before students can enroll for the 6 semester hours of thesis research. A written thesis must be submitted to and approved by the faculty.
2. *With a concentration in museum training*—Required: the general requirements stated under the Graduate School of Arts and Sciences, 42 semester hours of course work as follows: 12 hours of art history courses, taken before acceptance into the museum program; Art 201–2 and 271–72, and 18 additional hours of art history courses selected in consultation with the advisor, of which not more than 6 may be taken in museum-related courses. Students must maintain a quality-point index of at least 3.25. A reading knowledge examination in German or French must be passed before completion of the first 9 semester hours of course work. Students are required to pass the general written Master's Comprehensive Examination in art history and may also be required to pass a written comprehensive examination in museology as part of the requirements for the internship.

Acceptance into this program as a degree candidate is provisional, pending satisfactory completion of 12 semester hours of graduate art history courses and the approval of the Graduate Programs Committee (Department of Art).

The Art Department has established a program of study in affiliation with a number of museums and galleries including the Corcoran Gallery of Art, the Hirshhorn Museum and Sculpture Garden, the Museum of African Art, the National Museum of American Art, the Phillips Collection, the Renwick Gallery, and the Textile Museum.

3. *With a concentration in museum administration*—For details consult the chairman of the department.

Master of Fine Arts in the field of ceramics, design, printmaking, painting, photography, sculpture, or visual communication—Prerequisite, a Bachelor of Fine Arts or a Bachelor of Arts degree with a major in Fine Arts in the field of ceramics, design, drawing, painting, photography, printmaking, sculpture, or visual communication. A 3.00 undergraduate grade point average (on a 4.00 scale) and departmental approval of the applicant's work is required. This should consist of slide examples of work in the area of application as well as slides of representative works in other areas. Students planning

to do graduate work in printmaking or painting must have completed 12 semester hours of drawing at the undergraduate level before admittance to the master's program.

Required: the general requirements stated under the Graduate School of Arts and Sciences. As a tool requirement Master of Fine Arts candidates must take a tool course (3 to 6 hours) selected in consultation with the program advisor. As many as possible of the remaining 24 to 27 hours of course work should be in third-group courses, only 18 hours of which may be in one area, the remaining 6–9 hours are to be selected from related areas in consultation with the advisor. A creative thesis consisting of the execution of original works of art in ceramics, design, drawing, painting, photography, printmaking, sculpture, or visual communication will be completed under the supervision of a thesis advisor. In addition, the thesis must include a written statement and analysis of artistic purpose, subject to the approval of the thesis advisor and a second faculty reader. A representative portion of the work illustrating the creative thesis may be retained by the University at the discretion of the thesis director in agreement with the second reader.

Doctor of Philosophy in the field of art history.—Required: the general requirements stated under the Graduate School of Arts and Sciences, and a Master of Arts degree in art history. Candidates must also pass written examinations in French and German and General Examinations in one major area of specialization and two other areas of specialization. Language examinations should be completed within the first academic year of course work. Programs are planned in consultation with a departmental committee.

Areas of Specialization: classical art and archaeology, early Christian and Byzantine art, Northern Renaissance art, Baroque art, nineteenth- and twentieth-century European art, and American art.

Bachelor of Arts in Education and Human Development with a teaching field in art.—Prerequisite: the education curriculum, required: the art option and professional courses stated under the School of Education and Human Development.

ART HISTORY

First Group

1 **Principles of Art** (3) von Barghahn
An introduction to various art media, basic elements of art and thematic interpretations, European and non-Western traditions. (Fall and spring)

31–32 **Survey of Western Art** (3, 3) Robinson and Staff
A foundation for further study in the history of art. Art 31: prehistoric to Gothic art. Art 32: proto-Renaissance to modern art. (Art 31 and 32—fall and spring)

71–72 **Introduction to the Arts in America** (3, 3) Grubar and Staff
Art 71: Colonial beginnings to the Republican Age. Art 72: 19th century to the present. (Art 71 and 72—fall and spring)

Second Group

101 **Greek Art and Archaeology** (3) Staff
A study of the major achievements in architecture, sculpture, painting, and mosaics from 1000 B.C. to the Roman period. Special focus on the Parthenon and fifth-century Athens. Attention to recent discoveries and current excavations. (Fall)

102 **Roman Art and Archaeology** (3) Staff
Investigation of the architecture, sculpture, wall paintings, and mosaics from the second century B.C. to ca. 350 A.D. Consideration both of the city of Rome and of the monuments and society in the provinces. Attention to current excavations, including Pompeii and Herculaneum. (Spring)

103 **The Ancient Artist and His Workshop** (3) Staff
A study of the ancient craftsman's techniques, workshop organization, and position in society. Exploration of sculpture, architecture, painting, pottery, mosaics, gems, glass, and metalwork.

104 **Renaissance Art in Italy I** (3) Grace Evans
Early developments from the 13th to the 15th century. (Fall)

105 **Renaissance Art in Italy II** (3) Grace Evans
High Renaissance and Mannerism. (Spring)

106 **Renaissance Art in the North I** (3) Hitchcock
Northern painting from van Eyck through Bosch. (Fall)

107 **Renaissance Art in the North II** (3) Hitchcock
Northern painting and graphics from Durer through Brueghel. (Spring)

108 **18th-Century Art in Europe** (3) Hitchcock
Painting, sculpture, and architecture in France, Great Britain, and Italy. Emphasis on Watteau, Chardin, David, Hogarth, Gainsborough, Reynolds, Canaletto, and Tiepolo. (Spring)

109 **19th-Century Art in Europe I** (3) Robinson
Examination of Neoclassicism and Romanticism in the context of Western European historical and cultural developments. Emphasis on France, England, and Germany and the representative styles of David, Ingres, Delacroix, Turner, Constable, and Friedrich. (Fall)

110 **19th-Century Art in Europe II** (3) Robinson
Examination of the revolution in style of Realism, Impressionism, and Post-impressionism in the context of Western European political, social, and cultural developments. Emphasis on representative styles of Courbet, Manet, Monet, Cezanne, Van Gogh, and Gauguin. (Spring)

111 **Classical Archaeology** (3) Staff
Archaeological monuments of classical civilizations, with intensive study of one or more areas selected from architecture, sculpture, painting, or minor arts.

112 **Egypt and the Ancient Civilizations** (3) Staff
Exploration of the arts of Egypt, Sumeria, the Hittites, Assyria, and Persia, from 3000 to 400 B.C. Emphasis on the age of the Pyramids and the period of Tutankhamen. (Fall)

113 **Baroque Art in Italy** (3) Grose Evans
(Spring)

114 **Baroque Art in the North** (3) Hitchcock
Concentration on France, Flanders, and Holland, with emphasis on Poussin, Rubens, Van Dyck, and Rembrandt (Fall)

115 **Christian Iconography** (3) Grace Evans
Origins and development of Christian symbols and themes from early Christian to the Council of Trent.

116 **Islamic Art** (3) Staff

117 **Medieval Art I** (3) Anderson
Early Christian and Byzantine (Fall)

118 **Medieval Art II** (3) Anderson
Romanesque and Gothic. (Spring)

119 **Pre-Romanesque Art in the North** (3) Anderson
Merovingian and Carolingian. (Spring)

120 **East Asian Art** (3) Staff
May be repeated for credit when content differs.

121 **Spanish Art I** (3) von Barghahn
Discussion of areas selected from the art of ancient Iberia through the seventeenth century. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the content differs.

122 **Spanish Art II** (3) von Barghahn
Discussion of areas selected from the eighteenth through twentieth centuries. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the content differs.

129 **20th-Century Art in Europe** (3) Lader
Survey of 20th-century European painting, sculpture, and architecture, from their origins in the late 19th century through Surrealism. Emphasis on major

modernist movements and artists, including Matisse, Picasso, Kandinsky, and Mondrian. (Fall)

130 **20th-Century American Art** (3) Lader
Survey of 20th-century American painting and sculpture, focusing upon the avant-garde. Emphasis on artists of the Stieglitz circle and later modernist movements such as Abstract Expressionism, Pop, Op, Minimal, and Conceptual art. (Spring)

140 **Gothic Architecture** (3) Staff

145 **Folk Arts in America** (3) Grubar
Ceramics, woodcarving, ironwork, decorative painting, weaving, and other crafts.

147 **Primitive Art I: Ancient Civilizations of Mexico and Latin America** (3) von Barghahn
Survey of Pre-Columbian art and architecture from prehistoric period to the Spanish conquest, including Yucatan and Central American regions.

148–49 **19th-Century American Painting and Sculpture** (3–3) Grubar
Fall: 1800–1860; spring: 1860–1900. (Academic year)

150 **Landmarks in American Art** (3) Grubar

155 **The Aegean Civilizations** (3) Williams
An introduction to the excavational and multidisciplinary aspects of classical archaeology. Minoan and Mycenaean civilizations (1700–1200 B.C.) Interrelationships between Greek and Persian cultures of the sixth and fifth centuries B.C. (Spring)

156 **Early Medieval Sculpture** (3) Grace Evans

161 **Studies in Renaissance Art** (3) Grace Evans

162 **Principles of Museum Work** (3) Lawson
Introduction to the history and development of museums; problems of museum administration, connoisseurship, cataloguing, installation, conservation, and educational service.

165 **Primitive Art II: African, Oceanic, North American Indian** (3) von Barghahn
Survey of architecture, sculpture, and painting from ancient kingdoms to early 20th-century culture. Emphasis on imagery and iconography.

167 **The Dynastic Courts of Europe** (3) von Barghahn
Politics and royal patronage, 1400–1800. Areas may include France, Italy, Spain, Portugal, Austria, Germany, or Russia. Specific area announced in *Schedule of Classes*. May be repeated for credit if specific area is different.

169 **History of Decorative Arts: European Heritage** (3) Carson
Survey of changing styles of European furniture, textiles, ceramics, and glass, in the context of general trends in art history and changing patterns in economic, technological, social, and cultural history. From antiquity to the modern age. (Fall)

170 **History of Decorative Arts: American Heritage** (3) Carson
Examination of the decorative arts in America from the 17th century to the modern period. Exploration of changing visual characteristics in relation to the changing American experience. (Spring)

173 **History of the Cinema** (3) Staff
Same as CmTr 173. Laboratory fee, $25.

176 **American Architecture** (3) Longstreth
Same as AmCv/U&RP 175.

187 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy
Same as Engl/Fren/Ger/Hist/Rel 183.

191 **American Architecture** (3) Longstreth
Same as AmCv/U&RP 176.

192 **The American Cinema** (3) Staff
Same as AmCv 192.

197 **History of Photography: The 19th Century** (3) Foresta

198 **History of Photography: The 20th Century** (3) Foresta

Third Group

201–2 **Museum Projects** (3–3) Staff
Open only to candidates for the degree of Master of Arts in the field of museum training

203 **Primitive Art** (3) von Barghahn
(Spring)

207 **Modern Architecture** (3) Lader
Europe and America

211 **Seminar: Problems in Conservation** (3) Rose
Joint offering of the Art and Anthropology Departments. Individual conservation projects to determine composition, construction, decomposition of materials, and possible stabilization techniques. Conservation laboratory experience. Prerequisite or concurrent registration: Art or Anth 212. (Fall)

212 **Advanced Conservation Techniques** (3) Von Endt
Joint offering of the Art and Anthropology Departments. Physical structure, molecular biology, and chemistry of ethnographic materials. Chemistry and physics underlying the techniques used to conserve these materials. Prerequisite: Art or Anth 293, Chem 50, and permission of the instructor. (Fall)

216 **Medieval Painting** (3) Grace Evans
Painting and the decorative arts.

217–18 **Problems in Museum Work** (3–3) Ulberg
Art 217 is prerequisite to Art 218

*220 **Seminar: Baroque Art of the 17th Century** (3) Hitchcock
A reading knowledge of Italian is desirable for the Italian area and German for the northern area. (Spring)

*221 **Seminar: Renaissance Art** (3) Staff
A reading knowledge of French, German, or Italian is desirable, depending on the specific area. (Fall and spring)

*†243 **Seminar: American Art** (3) Grubar
(Fall and spring)

*†244 **Seminar: 19th-Century European Art** (3) Robinson
Reading knowledge of French desirable.

*†245 **Seminar: 20th-Century European Art** (3) Lader

*246 **Seminar: Classical Art** (3) Staff

*247 **Proseminar: Medieval Art and Archaeology** (3) Anderson

248 **Independent Research in Art History** (3)
(Fall and spring)

*261 **Seminar: Problems in Art History** (3) Staff

271–72 **Museum Techniques** (3–3) Staff
Open only to candidates for the degree of Master of Arts in the fields of museum training and museum studies. Practical work to be determined by Museum Training Committees at the institutions involved. (Academic year)

284 **Seminar: Studies in American Art and History** (3) Staff
Joint offering of the Art Department and the American Studies Program in affiliation with the National Portrait Gallery of the Smithsonian Institution. Exploration of selected problems and themes in American cultural history involving the use of artistic materials in different media; emphasis on methodology and analytic techniques. (Spring)

289–90 **Thesis Research** (3–3) Staff
(Fall and spring)

292 **Introduction to Conservation** (3) Rose
Interdepartmental course offered by the Art and Anthropology Departments. Method and theory of conservation, including fine arts, ethnographic, archae-

* Specific area announced in the *Schedule of Classes*. May be repeated for credit if the specific area covered is different.
† Laboratory fee, $15 when course is taught off campus.

ological, and monuments conservation: handling, restoration, preservation, storage, and display of museum specimens; basic materials of ethnographic objects and the ways they react to their environment. The fall section is open to conservation students and to those who plan to register for Art 293 in the spring. (Fall and spring)

293 **Preventive Conservation Techniques** (3) Rose
Interdepartmental course offered by the Art and Anthropology Departments. Practical aspects of preventive conservation, such as monitoring environmental conditions with measuring and recording devices, examining objects and documenting their conditions (including photography), and identifying sources of deterioration for various materials. Students will conduct tests, evaluate exhibition and storage areas, and participate in improving and correcting museum conditions. Prerequisite: Anth/Art 292.

Fourth Group
Limited to art history doctoral candidates. Offered as the demand requires.

*385–86 **Readings in Art History** (3–3)
*398 **Advanced Reading and Research** (arr.)
For students preparing for the doctoral examination.
*399 **Dissertation Research** (arr.)

FINE ARTS

Departmental prerequisite: Art 21–22 and 41–42.

First Group

21–22 **Design I: Basic** (3–3) Costigan, Teller
Required of all Fine Arts majors. Fundamental studies of principles and elements of design. Art 21: study of two-dimensional design. Art 22: three-dimensional studies. Art 21: Laboratory fee, $15. Art 22: Laboratory fee, $21. (Art 21 and 22—fall and spring)

23 **Photography I: Introduction** (3) Lake and Staff
Introduction to the principles of exposure and development of films and papers. Emphasis on creative expression. Laboratory fee, $54. (Academic year)

24 **Photography II** (3) Stephanie
Continuation of Art 23. Experimentation with black and white films and developers. Improvement of printing and exposure techniques. Emphasis on control for creative expression. Prerequisite: Art 23. Laboratory fee, $54. (Academic year)

41–42 **Drawing I** (3–3) Wright and Staff
Elementary investigation of concepts of drawing, both traditional and contemporary; training in perception, analysis of form in light and space; instruction in the use of graphic materials and media; exercises in connoisseurship. Material and model fee, $45 per semester. (Art 41 and 42—fall and spring)

51 **Introduction to Handbuilt Ceramics** (3) Ozdogan and Staff
Working with clay as an art form. Exploration of pinch, coil, slab, hump and press mold, paddling, and hollowing techniques. Sketch studies, reduction and oxidation kiln firings, clay and glaze making. Laboratory fee, $57, including unlimited materials and use of tools. (Fall and spring)

52 **Introduction to Wheelthrown Ceramics** (3) Ozdogan and Staff
Development of cylindrical and open forms. Trimming, clay and glaze making, reduction and oxidation kiln firings. Sketch studies. Laboratory fee, $57, including unlimited materials and use of tools. (Fall and spring)

* May be repeated for credit.

57 **Printmaking: Introduction to Relief and Planographic Techniques** (3) Griffith
Exploration in monochrome and color of basic methods of these techniques, i.e., woodcut, composite relief, monotype, and lithography. Emphasis on aesthetic qualities of prints. Laboratory fee, $36. (Fall)

58 **Printmaking: Introduction to Intaglio and Stencil Techniques** (3) Griffith
Exploration in monochrome and color of basic methods of these techniques, i.e., etching, engraving, collograph, stencil, and composite intaglio. Laboratory fee, $36. (Spring)

61–62 **Water Color** (3–3) Staff
Painting in transparent and opaque water color and in acrylic. Experimentation, figurative, and landscape. Laboratory fee, $15 per semester. (Academic year)

65–66 **Painting I** (3–3) A. Smith and Staff
Emphasis on personal expression with exposure to a variety of styles. Application of design principles to easel painting. Material and model fee, $39 per semester. (Academic year)

81–82 **Sculpture I** (3–3) Gates and Staff
Beginning study of design and fabrication of sculpture. Basic sculptural techniques for media, including clay, plaster, stone, and wood. Laboratory fee, $24 per semester. (Academic year)

Second Group

Second-group art courses may be repeated for credit with approval of the department

123–24 **Individual Problems** (3–3) Staff
Emphasis on problems and materials of specific interest to the student in any area of Fine Arts. Laboratory fee depending on area chosen.* Prerequisite: permission of instructor. (Academic year)

125–26 **Painting II** (3–3) A. Smith
Alteration of personal expression and structured problems dealing with still life and the figure. Use of acrylic and oil. Material and model fee, $39 per semester. (Academic year)

127–28 **Painting III** (3–3) Woodward
Studies in the interpretation of the figure and still life. Emphasis on color, space, planes, modulations. Alla prima and mixed techniques. Material and model fee, $39 per semester. (Academic year)

131 **Intermediate Ceramics: Wheelthrown Functional Forms** (3) Ozdogan and Staff
Aesthetic and technical development of wheelthrown functional ceramic forms. Exploration of attachments: lids, spouts, handles, and footing devices. Sketches and technical drawings, clay and glaze-making tests, varied temperature firings in reduction and oxidation atmospheres. Laboratory fee, $57. (Fall and spring)

132 **Intermediate Ceramics: Wheelthrown Nonfunctional Forms** (3) Ozdogan and Staff
Aesthetic and technical development of wheelthrown ceramic sculptural forms. Emphasis on section throwing, closed forms, and construction. Varied temperature firings in oxidation and reduction atmospheres. Clay and glaze making. Laboratory fee, $57. (Fall and spring)

133 **Ceramic Decoration** (3) Ozdogan
Aesthetic and technical development of surface decoration, with experimental projects in sgraffito, mishima, engobe, majolica, underglaze, overglaze, and relief techniques. Laboratory fee, $57. (Fall)

* Schedule of Fees: Ceramics—$57; 2-D Design—none; 3-D Design—$24; Drawing—$45; Printmaking—$36; Sculpture—$24; Typography—$40; Painting—none; Photography—$54; Visual Communication—$30; Lithography—$36; Serigraphy—$21

134 **Nonsilver Printing Processes in Photography** (3) Smigrod
Introduction to nonsilver and archaic photographic processes. At least three processes will be explored. Emphasis on creative expression. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $57. (Spring)

135–36 **Advanced Water Color** (3–3)
Development of techniques of water color; concentration on special projects. Laboratory fee, $15 per semester. (Academic year)

137 **Workshop in Materials, Methods, and Techniques** (3) Woodward, A. Smith, and Staff
Technical investigation of painting methods from the 14th century to the present. Preparation of grounds, media, underpainting, glazing. Laboratory fee, $15. (Fall and spring)

138 **Printmaking: History and Practice** (3) Griffith
Lecture survey through slides and original prints of the history of the fine art etching, engraving, woodcut, stencil, and lithograph. Laboratory demonstrations with student participation. This basic course is designed for artists, art historians, art dealers, appraisers, librarians, commercial artists, and collectors. There is no prerequisite. Laboratory fee, $24. (Summer)

139 **Design in Fiber** (3) Costigan
Emphasis on individual expression in two- and three-dimensional fiber works, with exposure to a variety of styles, attitudes, and materials. Laboratory fee, $9.

141 **Interior Design I** (3) Teller
Survey of materials and techniques used in domestic dwellings. Emphasis on diagrams, floor plans, and effective use of materials. Lecture and studio problems. Laboratory fee, $21.

142 **Interior Design II** (3) Teller
Survey of furniture style as applied to drawingboard problems in creative interior design. Prerequisite: Art 141. Laboratory fee, $21

143–44 **Serigraphy** (3–3) Teller
Fine Arts printmaking using serigraphic techniques. Utilization of all basic techniques; emphasis on aesthetic properties of prints. Laboratory fee, $21 per semester. (Academic year)

146 **Ceramic Restoration** (3) Ozdogan
Methods and techniques for museum and commercial application. Laboratory fee, $57. (Summer)

151 **Ceramic History and Technology** (3) Ozdogan and Staff
A survey of the history of ceramics and its technology. Lectures, demonstrations, and supplemental programs. Laboratory fee, $21. (Fall)

152 **Ceramic Sculpture** (3) Ozdogan, L. Smith
Developing an understanding of the sculptural ceramic form that integrates both quality and creativity. Techniques in hollow and solid construction. Varied temperature firings in reduction and oxidation atmospheres. Laboratory fee, $57. (Fall)

153 **Printmaking: Intermediate Study of Intaglio and Relief Techniques** (3) Griffith
Investigation in monochrome and color of these techniques, i.e., etching, engraving, woodcut, wood engraving, stencil, composite processes, and mixed media. Prerequisite: Art 57, 58. Laboratory fee, $36. (Fall)

154 **Printmaking: Introduction to Light-Sensitive Grounds** (3) Griffith
Exploration of the use of grounds on copper that are sensitive to light for the purpose of etching. Printing in monochrome and color. Prerequisite: Art 153 or equivalent. Laboratory fee, $36. (Spring)

157–58 **Printmaking: Advanced Study of Intaglio and Relief Techniques** (3–3) Griffith
Intensive exploration in monochrome and color of printmaking: etching, engraving, woodcut, wood engraving, stencil, collograph printing with light-sensitive grounds, composite techniques, and mixed media. Emphasis on

utilization of techniques in developing a personal statement and style. Prerequisite: Art 153, 154, or equivalent. Laboratory fee, $36. (Fall and spring)

159–60 **Drawing II** (3–3) Wright and Staff
Study and application of master drawing techniques. Investigation of perspective and anatomy. Emphasis upon conceptual development of personal style. Material and model fee, $45 per semester. (Academic year)

163 **Visual Communication I: Basic Layout** (3) Molina and Staff
Layout stages, including basic formats, production processes; working with type and basic skills. Prerequisite: Art 171. Laboratory fee, $30.

164 **Visual Communication II: Problem Solving** (3) Molina and Staff
Conceptual approach to problem solving. Various graphic design problems, including both small-format and large-format design in commercial and institutional graphics. Prerequisite: Art 163, 172. Laboratory fee, $30.

168 **Advanced Drawing Techniques** (3) A. Smith, Barnhart
Specific area announced in the *Schedule of Classes*. May be repeated for credit if the area covered is different. Laboratory fee, $36.

168 **Intermediate Ceramic Design in Handbuilding** (3) Ozdogan
Further concentration in handbuilding techniques of pinch, coil, slab, hump and press mold, paddling, and hollowing techniques. Sketch studies, clay and glaze tests. Orientation to studio operations and maintenance. Laboratory fee, $57. (Fall and spring)

171 **Typography I** (3) Molina and Staff
Basic calligraphy for traditional and contemporary use. Type theory, including specification, copy fitting, and study of letter form as used in graphic design. Laboratory fee, $30.

172 **Typography II** (3) Molina and Staff
Study of type classification, recognition, and adaptation. Methods of type specification, copy fitting, and typesetting processes. Typographic layout and alphabet design. Prerequisite: Art 171. Laboratory fee, $30.

174 **Visual Communication III: Seminar Projects** (3) Molina and Staff
Advanced studio projects in client presentations and development of portfolio. Prerequisite: Art 164 and 172. Laboratory fee, $30.

175 **Printmaking: Introduction to Lithography** (3) Barnhart
Study of techniques and materials related to printing images from stones and metal litho plates. Prints in crayon, tonal washes, and multicolor. Laboratory fee, $36.

177–78 **Survey of Printing and Illustration** (3–3) Staff
Exposure to a maximum range of illustrative processes, both practical and theoretical. Technical aspects of commercial printing processes; methods of preparation of artwork, photographs, and typographic proofs for commercial reproduction. (Academic year)

179–80 **Sculpture II** (3–3) Gates
Expansion of Sculpture I, utilizing advanced wood milling equipment and metal welding techniques. Prerequisite: Art 81–82. Laboratory fee, $24.

181 **Introduction to Color Photography** (3) Lake
Introduction to color through exposure and processing of color transparency films. Use of filters for creating and correcting color shifts, with emphasis on color as subject matter. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $54. (Fall)

182 **Introduction to Photographic Lighting** (3) Stephanic
Introduction to various lighting techniques. Available light manipulation, studio lighting, and copy lighting will be explored. Emphasis on creative expression. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $54. (Fall and spring)

183 **Experimental Photography** (3) Staff
Structured exploration of various photographic processes and techniques. Emphasis on creative expression. Content of course will vary; contact

department for current offering. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $54. (Fall and spring)

184 **Jewelry Design and Techniques** (3) Gates
Laboratory fee, $24. (Summer)

185–86 **Portrait Painting and Drawing** (3–3) C. Smith
Fall: Various media: drawing and pastel. Spring: Oil. Model fee, $45 per semester

189–90 **Sculpture III** (3–3) Gates
Advanced study in concepts and materials through creation of three-dimensional forms concentrating on relevance of scale and media. Relationship of sculpture to the environment. Prerequisite: Art 179–80. Laboratory fee, $24 per semester. (Academic year)

193 **Film Making I** (3) Staff
Introduction to the basic techniques and procedures for film making. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $54. (Fall and spring)

194 **Film Making II** (3) Staff
Continuation of Art 193 with more advanced projects. Prerequisite: Art 193 or permission of instructor. Laboratory fee, $54. (Fall and spring)

195 **Documentary Photography** (3) Staff
Historical development of documentary photography. Completion of two projects required. Laboratory fee, $54. Prerequisite: Art 23 and 24 or permission of instructor. Same as Jour 195. (Fall)

Third Group
All third-group art courses may be repeated for credit with the approval of the department.

205 **Advanced Photography: Zone System Tests** (3) Lake
Tone control through exposure development tests. Completion of laboratory manual required. Prerequisite: Art 181 and 182 or permission of instructor. Laboratory fee, $54. (Fall and spring)

206 **Advanced Photography: Color Printing and Zone Proofs** (3) Lake
Printing from color negatives. Correct color balancing and creative color shifts will be explored. Development of portfolio of prints utilizing approved theme and the exposure and development times established in Art 205 Prerequisite: Art 181 or 205, as determined by instructor. Laboratory fee, $54. (Fall and spring)

208 **Advanced Photography: Special Projects** (3) Lake and Stephanie
Independent projects requiring approval prior to registration. Prerequisite: Art 181 and 182, or permission of instructor. Laboratory fee, $54. (Fall and spring)

209–10 **Exhibition and Display Design** (3–3) Miller

224 **Advanced Ceramic Sculpture** (3) Ozdogan
Continuation of Art 152 with emphasis on individual approach. Exploration of mixed media and mold casting. Laboratory fee, $57. (Fall)

225 **Advanced Ceramic Decoration** (3) Ozdogan, Smith
Perfection of decorating techniques. Students establish style through independent exploration. Laboratory fee, $57. (Spring)

226 **Architectural Ceramics** (3) Ozdogan
Advanced studies in ceramic murals and sculptures designed for indoor and outdoor architectural concepts. Laboratory tests and activities. Laboratory fee, $57. (Spring)

231–32 **Design III** (3–3) Gates
New media and techniques in three-dimensional design. Laboratory fee, $24 per semester. (Academic year)

234 **Design IV: Jewelry Design** (3) Gates
Theory and fabrication of jewelry using basic metal techniques, assemblage approach, and lost-wax casting. Laboratory fee, $30. (Fall and spring)

Teller

235 **Design V: Textile Printing** (3)
Designing and executing textiles using the techniques of silk screen, block print, and batik. Laboratory fee, $21. (Fall and spring)

248 **Independent Research in Fine Arts** (3)
For master's degree candidates; open to limited number of qualified undergraduates, with permission. Independent research arranged in consultation with individual instructor and graduate advisor. May be repeated for credit. Laboratory fee depending on area chosen.* (Fall and spring)

Costigan

249 **Theory of Design** (3)
Application of design principles to problems of the artist in all disciplines. Emphasis on individual creativity, presentation, and criticism. Guest lectures on issues in contemporary art. Open to all M.F.A. candidates and to seniors with permission of instructor. Laboratory fee, $9.

Ozdogan

251 **Advanced Ceramic Design in Wheel Throwing** (3)
Individual projects on the potter's wheel. Student establishes personal style and direction and perfects skills. Either pottery or sculptural approaches encouraged. Research in clays, glazes, and firings is required. Laboratory fee, $57. (Fall and spring)

Ozdogan

252 **Advanced Ceramic Design in Hand Building** (3)
Individual projects in hand building. Student establishes style and direction and perfects skills. Either pottery or sculptural approaches encouraged. Research in clays and glazes is required. Laboratory fee, $57. (Fall and spring)

Ozdogan

253 **Industrial Ceramic Design/Mold Making** (3)
Study in the multiple production process from model making to finished duplicate form as it exists on factory level. Methods include all aspects of model designing and making in clay and plaster; mold making in plaster; production methods from molds including press molding, slip casting, jiggering, and jollying. Laboratory fee, $57. (Fall and spring)

Staff

254 **Ceramic Glazes: Calculation and Formulation** (3)
Laboratory fee, $21.

Teller

255–56 **Printmaking: Advanced Serigraphy** (3–3)
Utilization of principles and techniques of serigraphy toward development of personal statement and style. Prerequisite: Art 143–44. Laboratory fee, $21 per semester. (Academic year)

Griffith

257–58 **Printmaking: Etching and Engraving** (3–3)
Advanced problems in etching and engraving, including composite processes, light-sensitive grounds, mixed media, and theoretical and practical problems of color prints. Laboratory fee, $36. (Fall and spring)

Barnhart

259 **Printmaking: Advanced Lithography** (3)
Individual problems in lithography related to printing images from stones and metal litho plates. Prints in crayon, tonal washes, and multicolor. Emphasis on mastering the lithographic process and developing a personal statement and style. Laboratory fee, $36.

Griffith

260 **Printmaking: Relief Printing** (3)
Advanced problems, practical and theoretical, in woodcut, wood engraving, collograph, composite techniques, and mixed media in monochrome and color. Laboratory fee, $36. (Fall and spring)

Woodward

265–66 **Painting IV** (3–3)
Alternatives in pictorial dynamics. Assigned studio and independent problems in alla prima and mixed techniques. Material and model fee, $39 per semester. (Academic year)

Stephanic

267–68 **Individual Problems in Photography** (3–3)
Limited to M.F.A. candidates and qualified undergraduates. Prerequisite:

* *Schedule of Fees:* Ceramics—$57; 2-D Design—none; 3-D Design—$24; Drawing—$45; Printmaking—$36; Sculpture—$24; Typography—$30; Painting—none; Photography—$54; Visual Communication—$36. Serigraphy—$21. Lithography—$36.

Permission of instructor and approval of project prior to registration. May be repeated for credit. Laboratory fee, $54 per semester. (Academic year)

275 **Painting V** (3) Woodward
Development of personal imagery. Individual problems and critiques. Material and model fee, $39.

277 **Advanced Visual Communication: Packaging Design and Illustration** (3) Molina
Advanced studio projects. May be repeated for credit provided the content differs. Laboratory fee, $36. (Fall and spring)

278 **Advanced Visual Communication: Problem Solving and Applied Design** (3) Molina
Advanced studio projects. May be repeated for credit provided the content differs. Laboratory fee, $36. (Fall and spring)

279–80 **Sculpture IV** (3–3) Gates
Advanced study aimed at development of concept and style. Prerequisite: permission of instructor. Laboratory fee, $24. (Academic year)

281 **Sculpture V** (3) Gates
Emphasis on individual sculptural concepts and materials. Prerequisite: permission of instructor. Laboratory fee, $24. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
Laboratory fee depending on area chosen.* (Fall and spring)

ART THERAPY—GRADUATE PROGRAM

Professor D.E. Silber
Adjunct Professor E. Ulman *(Coordinator of Training)*
Adjunct Associate Professor E. Kramer
Assistant Professor K.J. Williams *(Program Director)*
Adjunct Assistant Professors W. Maiorana, M. Fleming, P.A. Ravenscroft, A.J. DiMaria
Clinical Instructors P. Howie, D.K. Conger, B.K. Mandel, N.J. Schoebel, K.M. Jensch, B. Shostak, N.J. Miller, J.C. Ramsay, E.S. Kramer, B. Sobol, M.M. Elfe, S. Geller, J.P. Torrenzano, T. Tripp

Master of Arts in the field of art therapy—Prerequisite: a bachelor's degree, evidence of significant training and/or experience in art, including painting, drawing, and clay modeling; course work in the behavioral and/or social sciences, including personality theory, abnormal psychology, and child psychology.

Required, the general requirements stated under the Graduate School of Arts and Sciences and successful completion of 36 credit hours of graduate course work. At least 21 credit hours must be in art therapy and must include ArTh 201, 203, 205–6 or 207 and 208, and 283–84.

Fields of emphasis: adult art therapy, family art therapy, child art therapy, and research.

Bachelor of Arts/Master of Arts in the field of art therapy—A five-year program leading to the B.A. in the field of fine arts or psychology and the M.A. in the field of art therapy. The first three years of the program consist of undergraduate course work. Application for admission to the M.A. program in art therapy will be made to the Graduate School of Arts and Sciences during the second semester of the third year; for admission to the graduate portion of the program, acceptance must be obtained prior to the start of the fourth year of the program. If acceptance to the M.A. program in art therapy is not desired or not obtained, the requirements for the B.A. degree in the undergraduate field chosen may be fulfilled by the successful completion of appropriate courses during the fourth year of study. If acceptance into the M.A. program in art therapy is obtained, the B.A. will be awarded after the successful completion of the fourth year of the program. Study

* *Schedule of Fees:* Ceramics—$57; 2-D Design—none; 3-D Design—$24; Drawing—$45; Printmaking—$36; Sculpture—$24; Typography—$30; Painting—none; Photography—$54; Visual Communication—$36; Serigraphy—$21; Lithography—$36.

during the summer following the award of the bachelor's degree and the following academic year would normally complete the M.A. degree requirements.

The following requirements must be fulfilled:

1. Students must meet the general requirements stated under Columbian College of Arts and Sciences and the Graduate School of Arts and Sciences.
2. The course requirements for the B.A. in either fine arts or psychology and for the M.A. in art therapy must be met.

201 **Introduction to Art Therapy** (3) Ulman
Lectures, presentation of illustrative case material, class discussion of assigned readings, field work. Survey covering range of art therapy practice, personality assessment and treatment approaches, historical development, main theoretical trends. Open only to art therapy degree candidates. (Fall)

202 **Case Studies in Art Therapy** (3) Ulman
Discussion of case material provided by students in order to refine methods of working and to improve written and oral reports. Instructor and other practitioners may provide supplementary illustrative material. Assigned reading. Prerequisite: ArTh 201, 203; open to others with permission of instructor. (Spring)

203 **Technique of Art Therapy** (3) Williams
Art therapy approaches with individuals and groups of different diagnostic categories in various settings presented through illustrative clinical examples. Students experiment with numerous techniques through the use of art materials. Open only to art therapy degree candidates. (Fall)

204 **The Freudian Model in Art Therapy** (3) Kramer, Ulman
Concepts of instinctual drives; ego development; mechanisms of defense; sublimation; transference and countertransference; maturation and regression applied to work with children, adults, families, and groups. (Spring)

205–6 **Family Art Techniques** (3–3) Ravenscroft
Principles of work with families, with emphasis on the use of art techniques for evaluation of family dynamics. The major focus is on opportunities to conduct and observe family art evaluations. Enrollment is limited to 12. Prerequisite: ArTh 201, 203. Open to art therapy degree candidates only. (Fall and spring)

207 **Art as Therapy with Children** (3) Maiorana
Introduction to the practical and theoretical considerations involved in art as therapy with children. Focus on psychodynamics, artistic developmental stages, methods of child art evaluation, and basic issues in therapeutic guidance of the child. Prerequisite: ArTh 201, 203; open to others with permission of instructor. (Fall)

208 **Art Therapy with Adolescents** (3) Fleming
Theoretical and practical issues in art therapy with adolescents in educational and clinical settings. Experiential work in art techniques appropriate to this population. Class discussion of readings on adolescent development. Prerequisite: ArTh 201, 203; open to others with permission of instructor. (Spring)

211 **Survey of Art Therapy** (3) Staff
Use of visual arts to enhance personal development; history, theories, range of practice in art therapy. Illustrated lectures, reading, discussion, studio work. Not intended for art therapy degree candidates. Open to advanced undergraduates with permission of instructor. (Fall and spring)

218 **Seminar: Systems of Psychotherapy** (3) Silber
Introduction to theory and technique of psychotherapeutic approaches: psychoanalytic, ego centered, nondirective, transactional, and others. Original sources surveyed. Prerequisite: ArTh 201 and 203, or 211, or permission of instructor.

220 **Process of Art Therapy** (6) Maiorana, Williams
Exploration of the treatment process. Students discuss literature from art therapy and related fields and rehearse fundamental ways of being an art

therapist through videotaped role playing. Designed to increase students' ability to evaluate their own therapeutic effectiveness. Prerequisites: ArTh 201, 203; open to others with permission of instructor. (Spring)

275 **Group Art Therapy** (3) Williams
Experience as participant, observer, and leader in an art-centered group; required reading; theory of group process. Open to art therapy master's degree candidates and others with permission of instructor. (Summer)

283–84 **Practicum in Art Therapy** (3–3) Staff
Minimum of 300 hours field work per semester connected with service to clients. On-the-job supervision supplemented by group supervision from the art therapy staff. Prerequisite: ArTh 201 and 203. Open only to art therapy degree candidates.

285 **Special Projects in Art Therapy** (3) Staff
Individual work based on research. Empirical, clinical, and library research may be undertaken, as well as the development of new procedures. Details to be worked out with each student. May be repeated for credit with advisor's approval. Open only to degree candidates. (Fall and spring)

289 **Special Topics in Art Therapy** (3) Staff
Connections between art therapy and other disciplines; new developments in the field. May be repeated for credit with approval of advisor. Open to art therapy degree candidates and others with permission of instructor.

290 **Workshops in Art Therapy** (3) Staff
Art therapists and other mental health professionals will conduct four weekend workshops during the semester. Emphasis on the elucidation of concepts of treatment through lectures, discussion, and participation. (Fall)

ASSOCIATION MANAGEMENT—GRADUATE PROGRAM

See the School of Government and Business Administration for the program of study leading to the degree of Master of Association Management.

270 **The Association: Roles, Responsibilities, Authority, Accountability, Influence** (3) Keane
Introduction to the Association Management Program; development and nature of interest representation; its history; varieties of associations and their roles and functions; legal constraints, responsibilities, and ethics. (Fall, spring, and summer)

271 **Marketing Management for Associations and Other Organizations** (3) Liebrenz
Market analysis, product planning, channels of distribution, pricing, and promotional decision making are presented, with particular application to associations. Topics include membership recruitment; fees, dues, and other monetary issues; physical location of the association; staff–membership contacts; promotion of association goals. (Fall, spring, and summer)

272 **Communications and Media Relationships for Associations** (3) Brown, Adams
Primarily for students in association management. The nature of the communication process, including both interpersonal and organizational communication. Problems and approaches; barriers to good communication. Methods of improving organizational communication. The media and their role; approaches to media relationships. (Spring)

273 **Association Representation and Lobbying** (3) Staff
The role of the association in the political process, including the context within which interests are represented before Congress and the executive branch. Interest groups and their ideas and techniques. Rules and regulations governing lobbying activities. (Spring and summer)

274 **Marketing Strategy for Associations** (3) Divita
Analysis of complex marketing problems of associations that involve policy and operational decisions. Creative marketing strategy. Prerequisite: AM 271 and 272. (Fall)

275 **Survey of Information Systems and Data Processing for Associations** (3) Staff
Introduction to the concepts of information systems as employed in associations. Data-base management systems, telecommunications systems, small business computers. (Fall and spring)

276 **Organization and Management of Associations** (3) Staff
For designated students in the Association Management Program. Integrative approach to organizational and management concepts, theories, and practices, with particular attention to the problems of associations and similar types of organizations. Functions, roles, and responsibilities of the association manager. (Fall and spring)

277 **Financial and Fund Accounting for Associations** (3) Staff
An overview of basic accounting principles and practices as they apply to associations, with attention to financial planning, reporting, and auditing. Investments, revenues, bonds, debt, government funds. (Fall and spring)

279 **Current Issues in Association Management** (3) Brown
A review of elements of association management, with attention to the number and variety of associations and their responsibilities in present-day society. Particular attention is given to the problems associations face now and will face in the future. A capstone seminar providing a review and synthesis of the Association Management Program. (Spring)

ASTRONOMY

See **Physics.**

BIOCHEMISTRY—GRADUATE PROGRAMS

Professors G.V. Vahouny, J.M. Bailey, A.L. Goldstein *(Chairman)*, C.R. Treadwell *(Emeritus)*
Associate Professors L.L. Gallo, A. Kumar, T. Moody, J.Y. Vanderhoek
Assistant Professors R.S. Schulof, G. Fiskum

Master of Science in the field of biochemistry—Prerequisite: a bachelor's degree. The undergraduate program must have included the following courses, or equivalent: BiSc 11–12; Chem 11–12, 22, 151–52, 153–54; Phys 1, 2.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including Bioc 221–22, 223, 227, 229, 299–300, Chem 251. The remaining courses are to be selected from Bioc 231, 232, 240, 250, 260, 270, 280. It is expected that students will complete all of the required work in approximately two years.

Doctor of Philosophy in the field of biochemistry—Required: the general requirements stated under the Graduate School of Arts and Sciences.

Research fields: endocrinology—thymosin, steroid hormones, prostaglandins; immunology—immunochemistry, gene transfer; lipid chemistry and metabolism—essential fatty acids, lipoproteins, complex lipids, cholesterol, peroxides, atherosclerosis, steroidogenesis; nutrition—dietary fiber, dietary fat, trace minerals; neurochemistry—endorphins, enkephalins, nerve growth factors, bombesin; bioenergetics—mitochondria, Ca^{++} transport, tumor cell metabolism, ischemia.

221–22 **General Biochemistry** (4–4) Gallo and Staff
A comprehensive course in general biochemistry for graduate students in biomedical sciences and undergraduate students in biology and chemistry. Prerequisite: Chem 152, 154. (Academic year)

223 **Physical Biochemistry** (3) Vanderhoek
Lectures cover basic laboratory techniques used in contemporary biochemical and molecular biological research. (Fall)

225–26 **Introduction to Biochemical Research** (arr.) Fiskum and Staff
Rotation through research projects in laboratory units within the Biochemistry Department to provide individualized in-depth training in the methods and instrumentation used. Limited to students in the Department of Biochemistry graduate program. (Academic year)

227 **Biochemistry Seminar** (1) Fiskum and Vanderhoek
Current literature in biochemistry. Limited to students in the Department of Biochemistry graduate program. May be repeated for credit. (Fall and spring)

229 **Biochemistry of Enzymes** (2) E. Anderson*
Content includes practical handling of enzymes, kinetics, reaction mechanisms, active site, isozymes, regulation, and other special topics. Prerequisite: Bioc 201 or 221. (Spring)

230 **Current Topics in Enzymology** (2) Bailey and Staff
Directed readings in various areas of enzymology. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 229.

231 **Bioenergetics** (2) Fiskum
Content includes biochemical thermodynamics, oxidation–reduction processes, oxidative phosphorylation, photosynthesis, and chemiosmotic energy coupling. Prerequisite: Bioc 221–22 or 201. (Fall)

232 **Protein Chemistry** (2) Steers† and Schechter‡
Content includes the theory and methods of protein chemistry, the structure-function relationship of proteins and other special topics. Prerequisite: Bioc 201 or 221. (Fall)

235 **Current Topics in Bioenergetics** (1 or 2) Fiskum
Directed readings in various areas of bioenergetics. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 231.

240 **Nutrition** (2) Walker and Staff
Content includes discussion of RDA, nitrogen balance, vitamins and minerals, diets, and other special topics. Prerequisite: Bioc 201 or 221–22. (Spring)

241 **Current Topics in Nutrition** (1 or 2) Walker and Staff
Directed readings in various areas of nutrition. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 240.

250 **Cell and Molecular Biology** (3) Kumar and Staff
Content includes the organization and replication of genetic material, transcriptional and translational machinery, regulation of eukaryotic gene expression, and other special topics. Prerequisite: Bioc 201 or 221–22. (Fall)

251 **Current Topics in Molecular Biology** (1 or 2) Kumar and Staff
Directed readings in the area of molecular biology. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 250.

252 **Biochemical and Molecular Aspects of Selected Diseases** (2) Kumar and Staff
Emphasis on the biochemical and molecular aspects of selected diseases. The format will be of a tutorial type, including presentations of material by students. (Spring)

256 **Biochemical Genetics and Inherited Metabolic Diseases** (1 or 2) Merril
Biochemical aspects of genetics and contributions of molecular biology to

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* Elizabeth Potts Anderson is Professorial Lecturer in Biochemistry in the G.W.U. School of Medicine and Health Sciences.
† Edward Steers, Jr., is Professorial Lecturer in Biochemistry in the G.W.U. School of Medicine and Health Sciences.
‡ Alan Neil Schechter is Professorial Lecturer in Biochemistry in the G.W.U. School of Medicine and Health Sciences.

understanding of human mutations and hereditary diseases. Prerequisite: Bioc 250. (Spring)

Gallo and Vanderhoek

260 **Lipids** (2)
Content includes the biosynthesis, metabolism, and functions of lipoproteins, prostaglandins, and other special topics. Prerequisite: Bioc 221–22. (Spring)

Vahouny and Staff

261 **Current Topics in Lipids** (1 or 2)
Directed readings in the area of lipid biochemistry. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 260.

Dodek*

263 **Steroids** (2)
For medical students; open to a limited number of graduate students. Content includes chemistry of steroid pathways of biosynthesis and metabolism, clinical manifestations of steroid imbalance, steroid changes in pregnancy, and other special topics. Prerequisite: Bioc 201 or 221–22. (Spring)

Fishman†

264 **Membrane-Associated Complex Lipids** (1)
Topics will cover the catabolism and biosynthesis of complex sphingolipids, inherited metabolic diseases associated with abnormal sphingolipid metabolism, membrane receptors for hormones and toxins, and other special topics. Prerequisite: Bioc 221–22. (Spring)

Naylor‡ and Staff

270 **Biochemistry and Cell Biology of the Immune Response** (2)
Biochemical aspects of the immune response at the molecular and cellular level. Modern experimental approaches to immunology and cell biology. Prerequisite: Bioc 221–22 and Micr 229, or permission of instructor. (Spring)

Goldstein and Staff

271 **Current Topics in Immunology** (1 or 2)
Directed readings in the area of biochemical immunology. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 270.

Moody and Staff

280 **Neurochemistry** (2)
Content includes molecular structure and function of nerve tissue; intra- and interneuronal communication mechanisms; biochemistry of various brain dysfunctions; and other special topics. Prerequisite: Bioc 201 or 221–22. (Fall)

Moody and Staff

281 **Current Topics in Neurochemistry** (1 or 2)
Directed readings in neurochemistry. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 280.

Staff

295 **Research in Biochemistry** (arr.)
Participation in a project under investigation in the department or one in a related field suggested by the student and approved by the staff. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

Staff

299–300 **Thesis Research** (3–3)
(Fall and spring)

Staff

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

Staff

399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

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* Oscar Irving Dodek, Jr., is Clinical Professor of Biochemistry in the G.W.U. School of Medicine and Health Sciences.
† Peter Harvey Fishman is Professorial Lecturer in Biochemistry in the G.W.U. School of Medicine and Health Sciences.
‡ Paul Henry Naylor is Assistant Research Professor of Biochemistry in the G.W.U. School of Medicine and Health Sciences.

BIOLOGICAL SCIENCES

Professors R.L. Weintraub *(Emeritus)*, K.F. Parker *(Emeritus)*, S.O. Schiff *(Chairman)*, D.L. Atkins, R.K. Packer
Adjunct Professors I.S. Kornicker, C.G. McWright
Professorial Lecturers W.A. Shropshire, Jr., J.G. Petrucciani, H. Hoffman
Associate Professors R.E. Knowlton, H. Merchant, T.L. Hufford, D.E. Johnson, J.R. Burns, R. Donaldson
Associate Professorial Lecturers P.E. Spiegler, J.C.C. Dickens, D.A.P. Houston, R.P. Eckerlin, D. Goldman
Assistant Professors E.F. Wells, K.M. Brown, D.L. Lipscomb, H.B. Wagner, R.W. Seelke
Adjunct Assistant Professor K.B. Hellman
Assistant Professorial Lecturer L.D. Killos

Bachelor of Arts or Bachelor of Science with a major in biology, botany, or zoology (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the social sciences and the humanities.)

2. Prerequisite courses—BISc. 11–12, or equivalent.

Bachelor of Arts with a major in biology, botany, or zoology—In addition to the general requirements listed above, the following must be taken:

1. Chem. 11–12, 151–52, and either 153–54 or 50. (The following courses are strongly recommended: Math. 31; Phys. 1–2, two years of French, German, or Russian; Stat. 91 or 127.)

2. (a) Required courses for the major in biology—A minimum of 24 semester hours of second-group courses, which should include at least 6 hours in biology, 6 in botany, and 6 in zoology. In fulfillment of the botany requirements, students may take either BISc. 133 or 137 but not both.

(b) Required courses for the major in botany—A minimum of 24 semester hours of second-group courses; a minimum of 12 hours must be taken in botany, and no more than one zoology course may be included. In fulfillment of the botany requirements, students may take either BISc. 133 or 137 but not both.

(c) Required courses for the major in zoology—A minimum of 24 semester hours of second-group courses; a minimum of 12 hours must be taken in zoology, and no more than one botany course may be included.

Bachelor of Science with a major in biology, botany, or zoology—The following requirements must be fulfilled:

1. Required courses in related areas—Chem. 11–12, 151–52, and either 153–54 or 50; Phys. 1–2; 3 semester hours of either mathematics or statistics (this requirement cannot be satisfied by waiver). Two years of French, German, or Russian are strongly recommended but not required.

2. (a) Required courses for a major in biology—A minimum of 30 semester hours of second-group courses, which should include at least 7 hours in biology, 7 in botany, and 7 in zoology. In fulfillment of the botany requirements, students may take either BISc. 133 or 137 but not both.

(b) Required courses for the major in botany—A minimum of 30 semester hours of second-group courses; a minimum of 15 hours must be taken in botany, and no more than two zoology courses may be included. In fulfillment of the botany requirements, students may take either BISc. 133 or 137 but not both.

(c) Required courses for the major in zoology—A minimum of 30 semester hours of second-group courses, a minimum of 15 hours must be taken in zoology, and no more than two botany courses may be included.

Special Honors—In addition to the general requirements stated under Regulations, in order to be considered for graduation with special honors, a student must maintain a cumulative 3.5 quality-point index in biological science courses and at least a 3.0 cumulative overall quality-point index.

Minor in biology—12 semester hours of second-group courses,* which must include at least 3 hours in biology, 3 in botany, and 3 in zoology.

Minor in botany—12 semester hours of second-group courses,* of which 8 hours must be in botany.

Minor in zoology—12 semester hours of second-group courses,* of which 8 hours must be in zoology.

Master of Science in the field of biology, botany, or zoology—Prerequisite: a bachelor's degree with a major in one of the following from this University, or an equivalent degree: (1) *Biology field*—an undergraduate major in biology, botany, or zoology; (2) *Botany field*—an undergraduate major in botany or biology; (3) *Zoology field*—an undergraduate major in zoology or biology. The undergraduate program must have included the following courses, or equivalent: Chem 151–52 and 153–54, or 50; Math 31; Phys 1, 2.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The minimum requirement consists of 24 semester hours of approved course work plus a thesis (equivalent to 6 semester hours). With the permission of the department, a student may elect a program of study consisting of 36 semester hours of approved course work without a thesis.

Master of Arts in the field of museum studies, with specialization in the biological sciences, see Museum Studies.

Doctor of Philosophy in the field of biology, botany, or zoology—Required: the general requirements stated under the Graduate School of Arts and Sciences, plus satisfactory completion of a Preliminary Examination and the General Examination in at least three areas of biology. The program of study, fields of study, and tool subjects are determined in consultation with an advisory committee appointed for each candidate.

Major Research Areas: ecology, evolution and systematics, plant biology, genetics, cell and molecular biology, developmental biology, vertebrate and invertebrate anatomy and physiology, marine and freshwater biology.

Master of Science and *Doctor of Philosophy in the field of geobiology*, see Geobiology.

Bachelor of Arts in Education and Human Development with a teaching field in biology—Interested students should contact the Office of the Dean of the School of Education and Human Development.

Departmental prerequisite: BiSc 11–12 or equivalent is prerequisite to all second-group courses in biology, botany, and zoology, except by permission of the instructor.

BIOLOGY

First Group

3–4 **Introductory Biology for Nonscience Majors** (3–3) Schiff
Lecture (2 hours), laboratory (2 hours). BiSc 3: Principles of cell biology; structure and function of plants and animals; animal behavior. BiSc 4: Human anatomy and physiology; genetics; evolution; ecology. Prerequisite to BiSc 4: BiSc 3. Material fee, $30 per semester. (Academic year)

11–12 **Introductory Biology for Science Majors** (4–4) Hufford, Lipscomb
Lecture (3 hours), laboratory (3 hours). BiSc 11: Investigation of principles of inheritance, physiology, development, and cell biology. BiSc 12: General survey of microorganisms, plants, and animals, including morphology, physiology, embryology, ecology, and evolutionary relationships among phyla. Designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Material fee, $40 per semester. (Academic year)

* BiSc 5 through 176 do not count toward fulfillment of the 12-hour second-group course requirements.

Second Group

103 **Marine Biology** (4) Knowlton
Lecture (2 hours), laboratory and field (4 hours), plus some extended field trips. Study of relationships between organisms and physical, chemical, and biological factors of the marine environment. Consideration of the open ocean and coastal ecosystems and man's influence on them. Material fee, $40. (Spring)

107 **Field Biology** (4) Merchant
Field study of altitudinal zonation, species hybridization, territoriality, energy balance, time and energy budgeting, effects of exposure, and effects of introduction of alien species on flora and fauna of Great Smoky Mountains National Park. (Summer, odd years)

108 **Organic Evolution** (3) Lipscomb
Synthetic theory of organic evolution including treatment of speciation, adaptive radiation, biogeography, population biology, sociality, and human evolution. (Fall)

111 **Introductory Microbiology** (4) Seelke
Lecture (2 hours), laboratory (4 hours). Survey of the major groups of microorganisms with emphasis on structure, physiology, ecology, phylogenetic relationships, and economic importance. Prerequisite: one year of chemistry. Material fee, $40. (Fall; spring, odd years)

112 **Advanced Microbiology** (3) Seelke
Lecture (2 hours), laboratory (3 hours). In-depth study of the biology of selected bacteria. Laboratory will emphasize the isolation of organisms from nature. Prerequisite: BiSc 111. Laboratory fee, $40. (Spring, even years)

113 **Protistology** (4) Hufford, Lipscomb
Lecture (2 hours), laboratory (4 hours). Examination of the diversity, evolution, morphology, physiology, ecology, and reproduction of both photosynthetic and heterotrophic protists. Material fee, $40. (Spring, even years)

122 **Cell Biology** (3) Donaldson
Structure and function of biological molecules, viruses, and cellular organelles. Prerequisite: one semester of organic chemistry. (Fall)

123 **Cell Biochemistry** (3) Donaldson
Introduction to the metabolism of generalized cells of animals, plants, and microorganisms, including energetics, enzymes, respiration, biosyntheses, and regulatory mechanisms. Prerequisite: one semester of organic chemistry. (Spring)

124 **Cell Biochemistry Laboratory** (2) Donaldson
Designed to illustrate some of the principles and techniques of biochemical experimentation. Prerequisite or concurrent registration: BiSc 123. Material fee, $40. (Spring)

127 **Genetics** (3) Johnson
Introduction to genetics, with emphasis on the integration of transmission of genetic traits and the chemical basis of gene action. Also includes cytogenetics, gene regulation, and examples of current applications of genetic technology. (Fall and spring)

128 **Genetics Laboratory** (1) Johnson
Study of genetic principles using Drosophila, *E. coli*, and lambda phage. Prerequisite or concurrent registration: BiSc 127. Material fee, $40. (Fall and spring)

138 **Advanced Genetics** (3) Johnson
Emphasis on the use of genetic analysis in solving modern biological problems. Prerequisite: introductory course in genetics. (Spring)

140 **General Ecology** (4) Merchant
Lecture (3 hours), laboratory and field (3 hours). Introduction to the concepts of limiting factors, biogeochemical cycles, trophic levels, and energy transfer and their relationship to the structure and function of population, species, communities, and ecosystems. Material fee, $40. (Fall)

142 **Behavioral Ecology** (3) Wagner
Lecture (2 hours), laboratory and field (2 hours). An evolutionary approach to the study of the relationship between behavior and ecology. Includes discussion of sociobiology. Prerequisite: BiSc 140. Laboratory fee, $40. (Fall, odd years)

144 **Aquatic Ecology** (4) Merchant
Lecture (3 hours), laboratory and field (3 hours). Principles applied to aquatic systems with special references to physiochemical properties, typical habitats, and communities. Laboratory fee, $40. (Spring, odd years)

150 **Physiological Ecology** (3) Wagner
Lecture (2 hours), laboratory and field (2 hours). Study of physiological adaptations of animals and plants to the abiotic and biotic environment. Prerequisite: BiSc 140. Laboratory fee, $40. (Fall, even years)

167 **Radiation Biology** (3) Schiff
Chemical, physical, and biological aspects of radiation; effects of radiation on cells and organisms, with emphasis on mammals. Recommended: cell biology and chemistry or physics. (Fall)

168 **Tropical Marine Biology** (4) Knowlton, Packer
Study of relationships between organisms and physical, chemical, and biological factors in a tropical marine-estuarine environment, conducted through ecological field work in characteristic tropical ecosystems on the island of San Salvador, Bahamas. Laboratory investigations on organism physiology. Recommended: BiSc 103 and/or 163. Material fee, $40. (Summer, even years)

169 **Applied Marine Ecology** (4) Knowlton
Field study of interactions among biotic and abiotic components of temperate-boreal ecosystems, with emphasis on man's impact and utilization of coastal resources, conducted through surveys of ecosystems along the Maine coast and associated laboratory work, supplemented by lectures and discussion. Application of ecological and oceanographic research techniques to polluted as well as relatively unspoiled sites. Recommended: BiSc 103 and/or 140. Material fee, $65. (Summer)

171 **Undergraduate Research** (arr.) Staff
Admission by permission of the staff member concerned. May be repeated for credit. Prerequisite: Chem 50 or 152; 16 semester hours in biological science courses. Material fee, $20 per semester hour. (Fall and spring)

172 **Independent Study in Cell and Molecular Biology** (2) Staff
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

173 **Independent Study in Developmental Biology** (2) Brown
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and Spring)

174 **Independent Study in Organismic Biology** (2) Staff
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

175 **Independent Study in Genetic and Evolutionary Biology** (2) Johnson, Lipscomb
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

176 **Independent Study in Environmental Biology** (2) Hufford, Merchant
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

185 **Human Nutrition** (3) Staff
Dietary requirements and their underlying physiological and biochemical bases; composition of natural and modified foodstuffs and additives; social and economic aspects of nutrition. (Fall)

Third Group

201–2 **Interdisciplinary Science** (4–4) Levy, Merchant, Parke
Joint offering of the Departments of Biological Sciences, Chemistry, and Physics. A treatment of scientific methodology and knowledge, both principles and facts. Designed to provide a basic understanding of the natural sciences and of the nature of science itself. Overview of the known fundamental principles developed in scientific observation of the physical universe. Fundamental principles are applied to systems of increasing complexity, with emphasis on physical, chemical, and biological systems. Students enrolled in natural science programs may not take this course for credit. Prerequisite: high school algebra or equivalent.

208 **Bioenergetics** (3) Merchant
Study of energy fixation and transfer in ecosystems and of their role in behavior, evolution, population dynamics, and species interactions. Prerequisite: BiSc 140 or equivalent. (Fall, odd years)

209 **Seminar: Principles and Mechanisms of Organic Evolution** (3) Lipscomb
Current problems and issues in evolution; speciation, macroevolution, biogeography, and topics of special interest to participants. Prerequisite: BiSc 108 or equivalent. (Fall)

210 **Principles of Systematics** (4) Lipscomb
Lecture (3 hours), laboratory and field (2 hours). Study of taxonomy and classification of organisms. Collection of morphological, biochemical, biogeographic, and fossil data, and analysis of these data using phenetic, cladistic, and synthetic methods. Material fee, $40. Prerequisite: BiSc 108 or equivalent. (Spring, even years)

220 **Seminar: Cell or Plant Biochemistry** (3) Donaldson
Course content changes each session, alternating between selected topics in cell biochemistry and plant biochemistry. May be repeated for credit. Prerequisite: BiSc 122 or 123 or 135 or equivalent. (Spring)

227 **Seminar: Genetics** (3) Johnson
Review of selected topics in genetics, with emphasis on current literature; topics of special interest to participants encouraged. May be repeated for credit. Prerequisite: BiSc 127 or equivalent. (Spring, even years)

228 **Population Genetics** (3) Johnson
Origin, maintenance, and possible significance of genetic variation in populations. Selection, genetic drift, microevolution of species, and speciation are emphasized. Both theoretical and applied aspects of population genetics are discussed. Prerequisite: BiSc 122 or 123 or equivalent. (Fall, even years)

229 **Cytogenetics** (3) Staff
Behavior of chromosomes in mitosis and meiosis as a basis for the transmission of genes from one generation to the next through reproduction and the influence of cytogenetic processes on the mechanisms of evolution. (Fall)

230 **Human Genetics** (3) Staff
Genetic mechanisms of transmission and expression of human traits, with emphasis on biochemical and cytogenetic aspects. Prerequisite: BiSc 127 or equivalent, previous course work in cell biology or cell biochemistry strongly recommended. (Spring)

243 **Seminar: Ecology** (3) Merchant
In-depth study of selected topics, including reports on original publications. May be repeated for credit. Prerequisite: BiSc 140 or equivalent. (Spring, even years)

248 **Analysis of Development** (3) Brown
Survey of current research in selected topics in experimental morphology, biochemical development, and developmental endocrinology. Emphasis on the principles and problems of pattern formation in animals. Prerequisite: BiSc 145 or equivalent. (Fall, even years)

249 **Seminar: Developmental Biology** (3) Brown
Discussion and reports on recent research on the endocrinological, genetic, and biochemical aspects of animal development. Prerequisite: one course in developmental biology or cell biology. May be repeated for credit. (Fall, odd years, spring, odd years)

272 **Scanning Electron Microscopy** (3) Atkins
Theory and practice of scanning and transmission electron microscopy, including specimen preparation, photography, and analysis of ultrastructural observations. Material fee, $65. (Spring)

273 **DNA Replication** (3) Seelke
A study of the enzymology of DNA replication in viral, prokaryotic, and eukaryotic model systems; positive and negative control theories in DNA replication and the biochemical and genetic evidence supporting these theories. Prerequisite: BiSc 111, 122, or 123. (Spring, even years)

274 **Gene Regulation and Genetic Engineering** (3) Seelke
The control of gene expression as illustrated by several prokaryotic and eukaryotic model systems; discussions of recombinant DNA techniques. Prerequisite: BiSc 127. (Fall, even years)

275 **Introduction to Recombinant DNA Techniques** (3) Seelke
Lecture, 1 hour; laboratory, 4 hours. Basic techniques of genetic manipulation: isolation of phage and plasmid DNA, cloning of genes, transformation of bacteria, mutagenesis of cloned genes, and other techniques. Prerequisite: BiSc 111 or 122 or 127 or equivalent. Laboratory fee, $40. (Spring, odd years)

295 **Research** (arr.) Staff
Investigation of special problems. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group (Applicable to Biology, Botany, and Zoology)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

BOTANY

Second Group

105 **Field Botany** (4) Wells
(Formerly Field Biology of Woody Plants)
Lecture (2 hours), laboratory and field (4 hours). Field and laboratory studies on local flora. Material fee, $40. (Fall; may be repeated for credit during the summer)

109 **Developmental Plant Anatomy** (4) Hufford
Demonstration, observation, discussion (6 hours). Initiation and ontogeny of tissues and organs of vascular plants. Material fee, $40. (Spring)

110 **Plant Diversity** (4) Hufford
(Formerly Comparative Plant Morphology)
Demonstration, observation, discussion (6 hours). Evolutionary morphology and life histories as a basis for a phylogenetic study. Material fee, $40. (Fall)

125 **Flowering Plants** (4) Wells
Lecture (2 hours), laboratory and field (4 hours). Origin, evolutionary development, and principles of systematics of flowering plants. Material fee, $40. (Spring)

133 **Economic and Ethnobotany** (3) Hufford
A study of the importance of plants to humans: consideration of plants in folklore, in religion, in commerce, and as food. Narcotic, medicinal, and poisonous aspects of plants will be discussed. Material fee, $30. (Spring, odd years)

135 **Plant Physiology** (4) Donaldson
Lecture (2 hours), laboratory (4 hours). Physiology of seed plants with emphasis on growth, development, tropisms, and reproduction. Prerequisite: Chem 11–12. Recommended: Chem 50 or 151–52. Material fee, $40. (Fall)

137 **Horticulture** (4) Houston
Lecture (2 hours), laboratory (4 hours). Basic principles of growth, propagation, and care of ornamental plants. Material fee, $40. (Spring)

141 **Plant Ecology** (4) Wells
Lecture (2 hours), laboratory (4 hours). Several Saturday and weekend field trips required. Material fee, $40. (Fall)

Third Group

221 **Variation and Evolution in Plants** (3) Wells
Biosystematics of plants, covering the literature, concepts, and methodology of chemotaxonomy, breeding systems, cytogenetics, population genetics, and other studies of speciation, evolution, and classification. Prerequisite: BiSc 105 or 108 or 125 or 127. (Spring, even years)

238 **Seminar: Current Topics in Phycology** (3) Hufford
(Spring, odd years)

242 **Advanced Plant Ecology** (3) Wells
Review of selected topics in adaptive plant strategies and physiological plant ecology. Prerequisite: BiSc 107 or 140 or 141. (Spring, odd years)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

ZOOLOGY

Second Group

101 **Invertebrate Zoology** (4) Knowlton
Lecture (2 hours), laboratory (4 hours). General survey of invertebrate animals, including classification, morphology, physiology, embryology, and evolutionary relationships among phyla. Material fee, $40. (Fall)

102 **Advanced Invertebrate Zoology** (4) Knowlton
Lecture (2 hours), laboratory and field (4 hours). Study of invertebrate systems (cells, tissues, organs, organisms), with emphasis on functional aspects (physiology and ecology) and taxonomy of important groups. Prerequisite: BiSc 101 or equivalent. Material fee, $40. (Spring, odd years)

104 **Comparative Vertebrate Anatomy** (4) Atkins
Lecture (2 hours), laboratory (4 hours). Evolution and comparative morphology of chordata, stressing recent forms. Material fee, $40. (Fall; spring, odd years)

120 **Animal Behavior** (3) Wagner
Principles of animal behavior, including mechanisms and manifestations from simple reflex systems to social interaction. (Spring)

143 **Animal Ecology (4)** Merchant
Lecture (3 hours), laboratory and field (3 hours). Application of ecological principles to the understanding and manipulation of animal populations. Prerequisite: BiSc 140 or permission of instructor. Laboratory fee, $40. (Spring, even years)

145 **Principles of Development (4)** Brown
Lecture (2 hours), laboratory (4 hours). Development of animals, especially vertebrates, with reference to human embryos. Principles are illustrated by modern experimental studies of developmental problems. Laboratory analysis of organ system formation in the frog, chick, and pig. Material fee, $40. (Fall; spring, even years)

146 **Experimental Developmental Biology (4)** Brown
Lecture (2 hours), laboratory (4 hours). Molecular and cellular biology of development through examination of the literature and complementary laboratory experiments. Laboratory exercises involve micromanipulative and biochemical operations on embryos fertilized in the lab. Prerequisite: BiSc 145 or equivalent, or permission of instructor. Recommended: a course in cell biology. Laboratory fee, $40. (Spring)

148 **Histology (4)** Burns
Lecture (2 hours), laboratory (4 hours). Introduction to microscopical anatomy of normal tissues and organs with emphasis on the interrelationship of structure and function. Material fee, $40. (Spring; fall, odd years)

153 **Survey of Neurobiology (4)** Atkins
Lecture (3 hours), laboratory (2 hours). Study of the gross and cellular anatomy, physiology, and biochemistry of the nervous system; emphasis on mammals. Material fee, $40. (Fall)

155 **Parasitology (4)** Eckerlin
Lecture (2 hours), laboratory (4 hours). Introduction to animal parasitology; survey of parasitic types from protozoa through arthropods. Material fee, $30. (Fall)

156 **Ichthyology (4)** Burns
General biology of fishes, including structure, function, distribution and evolution, with emphasis on adaptations. Prerequisite: background in comparative anatomy and vertebrate zoology, or permission of instructor. Lecture (3 hours), laboratory (2 hours). Material fee, $40. (Fall, even years)

157 **Comparative Endocrinology (4)** Burns
Lecture (3 hours), laboratory (2 hours). Comparative study of basic principles of chemical integration, neuroendocrine relationships, and mechanisms of hormone action. Prerequisite: BiSc 104, 165 and/or concurrent registration in Chem 151–52 or 50. Material fee, $40. (Fall)

163 **Human Physiology (3)** Packer
Introduction to the function of organ systems of the human body. (Fall)

164 **Human Physiology Laboratory (1)** Packer
Study of basic physiology laboratory techniques; emphasis on the experimental study of homeostatic mechanisms in humans. Prerequisite or concurrent registration: BiSc 163. Material fee, $40. (Fall)

165 **Advanced Human Physiology (4)** Packer
Lecture (3 hours), laboratory (3 hours). Detailed study of selected organ systems, stressing chemical and physical bases. Prerequisite: BiSc 163 and 164, or equivalent. Prerequisite or concurrent registration: Chem 151–52 or 50. Material fee, $40. (Spring)

166 **Ornithology (3)** Wagner
An introduction to the study of birds from an ecological perspective. Includes visits to the collections and exhibits of the Smithsonian Institution's Museum of Natural History and National Zoological Park, several short field trips, two full-day Saturday trips for waterfowl and migrants, and one evening field trip for owls. Prerequisite: BiSc 11–12 or equivalent. Material fee, $30. (Spring)

Third Group

204 **Seminar: Invertebrate Zoology** (3) Knowlton
Review of selected topics in physiology, development, and ecology of invertebrate animals, including reports on original publications. May be repeated for credit. (Fall)

211 **Symbiosis and Evolution** (3) Lipscomb
(Formerly Parasites and Evolutionary Biology)
Study of the adaptations and evolution of parasites, including coevolution of parasites and hosts, competition for hosts, evolution of life cycles, and topics of special interest to participants. (Spring, odd years)

212 **Seminar in Comparative Reproductive Biology** (3) Burns
Review of selected topics in animal reproduction, including neuroendocrine regulation, reproductive cycles and behavior, and gonadal pathology. Prerequisite: BiSc 165 or equivalent. (Spring)

252 **Seminar: Neurobiology** (3) Atkins
Study of current publications in comparative neurobiology. May be repeated for credit with instructor's permission. (Spring, even years)

256 **Fish Physiology** (3) Packer
A survey of major organ systems and homeostatic mechanisms of fishes with emphasis on teleosts. Prerequisite: BiSc 163 or 156 or equivalent. (Spring, odd years)

265 **Comparative Environmental Physiology** (3) Packer
Survey of the physiological basis of adaptation of animals to diverse environments, emphasis on nonmammalian vertebrates. Prerequisite: BiSc 165 or equivalent. (Fall)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

BUSINESS ADMINISTRATION

Professors R.B. Eastin, H.R. Page *(Emeritus)*, F. Amling, G. Black, P.D. Grub, N.M. Loeser, G.P. Lauter, A. El-Ansary *(Chairman)*, B. Burdetsky, S.F. Divita, R. Eldridge, R.F. Dyer, W.C. Handorf, S.N. Sherman, W.J. Winstead *(Visiting)*, H.G. Askari, F. Ghadar, Y.S. Park
Professorial Lecturers S. Thurm, S.A. Seelig, D.A. Peterson, D.H. Watts, A. Hammad
Associate Professors R.L. Holland, H.J. Davis, J.M. Sachlis, P.B. Malone III, D.J. Lenn, M.L. Liebrenz, L.M. Maddox, J.B. Thurman, J.H. Perry
Associate Professorial Lecturers I.H. Joseph, J.T. Heimbach, D.L. Edgell
Assistant Professors T.M. Barnhill, D.R. Kane, N.G. Cohen, P.S. Peyser, M.S. Katzman, W. Margrabe, C.C. Shepherd, Jr., M.L. Slagle, E.J. Englander, F. Robles, G.K. Swensen, T.F. Shine *(Visiting)*, C.J. Prager *(Visiting)*, A. Anckonie *(Visiting)*
Assistant Professorial Lecturers M.W. Hudgins, M.J. Moran, D.E. Laufenberg, R.A. Beverage, D.E. Kreps, Y. Lee, T.J. Curry, D.M. Devaney, S. Harris, W.N. LaForge, M. Regalia, S.M. Mallamad, G.I. Friend, B. Madigan, B.A. McKinney
Lecturers R.M. Eldridge, L.A. Gillis

See the School of Government and Business Administration for programs of study in business administration leading to the degrees of *Bachelor of Business Administration*, *Master of Business Administration*, and *Doctor of Business Administration*.

First Group

51 **Introduction to Business** (3) Davis, Katzman, Thurman, Slagle
Structure, activities, and problems of business enterprise; its contribution to the individual and society; careers in business. (Fall and spring)

Second Group

101 **The Business Environment** (3) Lenn, Englander
Economic and legal environment of business enterprise; social and political

influences; contemporary problems and issues. Restricted to seniors in the B.B.A. program. (Fall and spring)

Shepherd, Kane

104 **Commercial Law** (3)
Fundamental concepts and principles of law encountered in commercial activity; contracts, sales, bailments, agency, negotiable instruments, real and personal property, bankruptcy; other topics. Basic legal considerations in business decision making. (Fall and spring)

Burdetsky, Malone

110 **Personnel Management** (3)
The labor force and labor markets. Industrial personnel and manpower programs, organization and policy in personnel activities. (Fall and spring)

Burdetsky

115 **Leadership in Personnel Management** (3)
A study of the philosophy, principles, policies, and programs for effective personnel management and industrial relations as portrayed by case studies drawn from business and government. Prerequisite: BAd 110. (Fall)

Burdetsky

117 **Collective Bargaining** (3)
American unionism and collective bargaining; economic, social, and public policy considerations. The negotiation and administration of collective bargaining agreements. Prerequisite: BAd 110. (Spring)

Handorf, Cohen

120 **Business Finance** (3)
Analyzing capital requirements and methods of acquiring funds; planning efficient use of capital. Asset management, financial analysis, sources of funds, capital budgeting, and cost of capital. Prerequisite: Acct 51–52; Econ 1; Math 51–52; Stat 51. (Fall and spring)

Amling, Cohen

123 **Investment and Portfolio Management** (3)
Theory and principles of security analysis and portfolio management, including analysis of the national economy, industry, company, and security markets. Risk–reward and computer-aided analysis. Prerequisite: BAd 120. Laboratory fee. (Fall and spring)

Handorf, Barnhill

124 **Advanced Financial Management** (3)
Analysis and readings investigating the theoretical relationships underlying financial management. Emphasis is placed upon cases for decisions involving long-term assets, financing, dividend policy, and other special topics in finance. Prerequisite: BAd 120. Laboratory fee. (Fall and spring)

Margrabe, Cohen

130 **Working Capital Management** (3)
The analysis of corporate short-term sources and uses of funds. Optimization techniques and case studies emphasized. Bank lending practices are evaluated within the working capital area. Prerequisite: BAd 120. (Spring)

Handorf

132 **Real Estate Investment** (3)
Principles of real estate investment, including valuation, appraisal, financing, and development, in addition to a discussion of the mortgage market and its institutions. Prerequisite: BAd 120. (Fall)

Cohen

133 **Fundamentals of Insurance and Risk Management** (3)
Functions of insurance and risk management in business enterprise. (Spring)

Handorf

135 **Capital Formation** (3)
The process of capital formation in a free enterprise economy. Roles of business firms, financial intermediaries, money and capital market institutions, governmental regulatory agencies, fiscal and monetary policies. Prerequisite: BAd 120. (Spring)

El-Ansary, Swensen, Maddox

140 **Basic Marketing Management** (3)
Role of marketing in the socioeconomic system, consumer behavior analysis, impact of consumerism. Major decision areas of product planning, pricing, and distribution; tools of marketing research and demand analysis. Prerequisite: Econ 1–2, Stat 51. (Fall and spring)

Dyer, Maddox, Swensen

142 **Consumer Behavior** (3)
An examination of the social, cultural, and psychological factors influencing the behavior of consumers. Topics include models of buyer behavior, consumption patterns, market segmentation research, attitude formation and change, brand loyalty, adoption of innovations, and store choice decisions.

Marketing management and public policy implications of consumer research studies are stressed. Prerequisite: BAd 140. (Fall and spring)

143 **Marketing Research** (3) Dyer, Swensen
Basic methods and techniques of marketing research, problem definition, data collection, market survey and experimental design, data analysis and presentation. Special topics: questionnaire construction and data analysis with statistical software packages. Prerequisite: BAd 140, Stat 51, Mgt 56. Laboratory fee. (Fall and spring)

148 **Advertising** (3) Maddox, Dyer, Thurm
Planning an advertising campaign. Consumer and market information, message appeals, media selection and scheduling, measuring effectiveness. Current criticism and regulation of the advertising function. Other major marketing communication tools, including personal selling and sales promotion. Prerequisite: BAd 140, 142. (Fall and spring)

149 **Advanced Advertising Campaigns** (3) Maddox
An application of the principles of marketing and advertising to a real-world situation in the development of an advertising campaign. Students work in an advertising agency atmosphere to perform such tasks as situation analysis, market segmentation, marketing research, media selection, and copywriting in the preparation of the advertising campaign. The culmination is the presentation of the campaign at a national competition sponsored by the American Advertising Federation. Five students from the class will be selected as presenters. Prerequisite: BAd 140, 142, 143, 148, or permission of instructor. (Spring)

150 **Salesmanship and Sales Management** (3) Liebrenz, Divita
Development of personal selling and presentation skills; examination of types of selling situations. Organization of sales department, sales planning and forecasting, quotas, territories, performance standards, and analysis and control of distribution costs. Prerequisite: BAd 140. (Fall and spring)

152 **Retailing Management** (3) El-Ansary
A study of retailing management and strategy covering the current environment of retailing, retail market and financial analysis, store location and design, inventory management, and non-store and service retailing. Industry executive and student presentations and case analyses. Prerequisite: BAd 140. (Fall)

159 **Marketing: Strategic Planning** (3) Divita, El-Ansary
A capstone seminar for marketing majors. Analytical integration of material covered in previous marketing courses. Marketing strategy literature, financial dimensions of marketing management, and comprehensive cases. Prerequisite: BAd 140, 142, 143, 150, and one additional marketing major field course. (Spring)

160 **Introduction to International Business** (3) Robles
Social, cultural, political, legal, and technological environment of multinational business, emphasizing host-government/multinational corporation interface. Terminology, trade uses and practices, conditions essential for successful business operations, including export and import procedures, documentation, and legal requirements; physical movement of goods in international business. (Fall and spring)

166 **International Marketing Management** (3) Lauter, Robles
Scope of international markets; factors in assessing world marketing opportunities; international marketing product, pricing, distribution, and promotion program development in dynamic world markets and global environment. Prerequisite: BAd 140. (Fall and spring)

168 **Foreign Market Analysis** (3) Grub
Patterns of world trade by country, commodities, and products; selected regional analyses, in-depth market studies. Prerequisite: BAd 160, 166. (Fall and spring)

171 **International Business Finance** (3) Eldridge, Askari, Anckonie
Analysis of the international economic environment and its influence on corporate financial management of international operations. Prerequisite: BAd 120. Laboratory fee. (Fall and spring)

173 **International Banking** (3) Ghadar, Park
Theory and practice of international banking; analysis of international commercial and investment banking from a management perspective; subjects include current international monetary and financial environment, money in capital markets, and topical problems of international banking from a management perspective. Prerequisite: BAd 171. Laboratory fee. (Fall and spring)

175 **International Monetary and Financial Issues** (3) Eldridge
International macro- and micro-issues of money, banking, and finance. Interrelationship, from a management perspective, of basic forces shaping international and financial policy. Topics include international monetary systems, Eurocurrency markets, LDC debt crises, role of the International Monetary Fund and World Bank, and development banking issues. For advanced undergraduate students with a background in international business finance. Prerequisite: BAd 171 or permission of instructor. (Fall and spring)

180 **Materials and Purchasing Management** (3) Perry, Sherman
Product and nonproduct purchases and materials cycle management. Requirements planning and make-or-buy decisions. Source identification, qualification, and selection. Pricing, inventory, control systems, buying practices, purchase records. Policy and procedure development, ethical questions. Case analyses. (Fall and spring)

181 **Management of Public Acquisitions** (3) Perry, Sherman
Requirements planning, regulatory and policy environment, programming and budgeting factors, solicitation and award methods pertinent to public procurement, strategies, international purchasing, public grants, audit, and ethical considerations. (Fall)

182 **Transportation Management** (3) Perry, Sherman
Transportation systems of the United States. Economic role, modes of transport, international perspectives, private and public finance, policy issues. Traffic management, carrier management. Regulatory change, energy, environmental and safety concerns. (Spring)

183 **Logistics Management** (3) Perry
Physical distribution and customer service management. Storage, inventory, financial and information implications. International distribution. Strategy formulation for the logistics system. Case analyses. (Fall)

184 **Contract Management** (3) Sherman
The unique relationships created when independent organizations are joined by contract over long periods. Terms and conditions, specifications, information flow, progress monitoring. Direction and control problems, property issues, financial relationships, changes, schedule adherence, negotiation, termination, and audit problems. (Spring)

188 **Managing Production/Operations** (3) Holland, Perry
(Formerly BAd 193)
Basic principles and methods of manufacturing production. Manufacturing facilities, plant, and equipment. Illustrations selected from various process and fabrication industries. Prerequisite: Math 51, 52; Stat 51 or equivalent; BAd 110, 191. Restricted to seniors in the B.B.A. program. (Fall and spring)

190 **Special Topics in Business Administration** (3) Staff
Experimental offering; new course topics and teaching methods.

191 **Fundamentals of Management** (3) Davis, Malone, Thurman, Katzman, Slagle
Planning, organizing, directing, coordinating, and controlling activities of the administrative unit: evolution of management thinking. (Fall and spring)

192 **Small-Business Management** (3) Holland
Theory and practice of small-business management. Focus on effective management of small firms, essentials of planning and organizing the firm, financial and administrative controls, evaluation of alternative business forms, and comparison of purchase of an ongoing firm, franchising, and new business start-ups. The role of small business in American society; historical perspective of entrepreneurship. Prerequisite: BAd 191.

197 **Strategy Formulation and Implementation** (3) Thurman, Katzman, Malone
(Formerly BAd 198, Business Policy and Administration)
An integrative capstone course, covering the concept of strategy, tasks and processes of strategy and policy formulation and implementation, and ramifications of aligning the functional and behavioral processes of the organization to facilitate accomplishment of the organization's mission and objectives. The course develops the student's skills in conducting situation audits, diagnosing organizational problems, formulating and selecting strategic alternatives, and recognizing problems inherent in strategy implementation. Methodology includes case analyses, decision simulations, and lectures. Restricted to seniors in the B.B.A. program. Prerequisite: BAd 110, 120, 140, 191, and 188. May be taken concurrently with BAd 188. (Fall and spring)

199 **Individual Research** (arr.)
Assigned topics. Admission by prior permission of advisor. May be repeated once for credit. (Fall and spring)

Third Group

201 **Social and Legal Environment of Business** (3) Kane, Shepherd
This course is a First-Level requirement for M.B.A. students; it may not be used to satisfy a Second-Level requirement. Contemporary social forces acting on business management: business responsibility, ethics. The American legal system, federal regulation, constitutional and administrative law. Business and public policy. Emphasis on court decisions relating to business. (Fall and spring)

202 **Business–Government Relations** (3) Black, Lenn, Englander
Economic, political, and philosophical foundations of the business–government relationship in theory and practice. Antitrust, public utility, and other regulation, consumer and environmental protection, conditions of employment, effective business response—present status and future prospects. Prerequisite: BAd 201 or equivalent. (Fall and spring)

203 **Federal Government Regulation of Society** (3) Tolchin
Same as PAd 216.

204 **Regulation of Business: Administrative Law** (3) Kane
Principles of federal regulation of business through administrative bodies. Analysis of sources and limits of the powers and prerogatives of administrative bodies in adjudicative, executive, and rule-making functions. Theoretical and practical aspects of regulations; other topics. Prerequisite: BAd 201, 202, or equivalent. (Fall)

205 **Business Representation and Lobbying** (3) Joseph
Strategies, tactics, and techniques used by business in representing itself to the legislative and executive branches and regulatory agencies of the federal government. Legal and practical constraints. Ethical considerations. (fall)

206 **Applied Microeconomics** (3) Black
Applications of economic theory to public and private decisions affected by the economic and general business environment. Demand, production, costs, profits, investments, inventory, market structure. Prerequisite: Econ 217 and Mgt 270 or equivalents. (Spring)

208 **Macroeconomic Policy and Business** (3) Black
Interpretation of economic conditions in the short and long run; theory and practice of monetary and fiscal policy; applications of business conditions

analysis to business planning, management, and policy. Prerequisite: Econ 218 and Mgt 270 or equivalents. (Fall)

209 **Seminar: Business Economics and Public Policy** (3) Black, Lenn
Analysis and discussion of selected issues by students and representatives of government and business. Prerequisite: BAd 201, 202, or equivalent. (Spring)

210 **Personnel Management** (3) Eastin, Loeser, Malone
Survey of personnel management practices and procedures, including labor–management relations. (Fall and spring)

211 **Seminar: Personnel Management** (3) Burdetsky, Eastin, Katzman
Industrial personnel and manpower management, research in advanced problems. (Spring)

212 **The Personnel Manager** (3) Eastin
The personnel manager and his or her place in the organization, relation to other executives, policy role, and relations with chief executive. Problems of the senior personnel executive. Prerequisite: BAd 210 or permission of instructor.

215 **Leadership and Executive Development** (3) Loeser, Malone
Theories of managerial leadership; issues and problems associated with leadership in large organizations and at higher management levels: executive selection and development. Prerequisite: Mgt 205 or permission of instructor. (Fall and spring)

217 **Unionism and Collective Bargaining** (3) Burdetsky
The American labor movement. Collective bargaining and the conduct of labor relations under collective bargaining agreements. (Fall)

218 **Current Issues in Unionism, Collective Bargaining, and Labor Relations** (3) Burdetsky
Current problems and issues. Prerequisite: BAd 217. (Spring)

220 **Business Financial Management** (3) Sachlis, Peyser, Margrabe
This course is a First-Level requirement for M.B.A. students; it may not be used to satisfy a Second-Level requirement. Theory, policy, and practice in financial management; financial analysis, sources of funds, investing, capital planning, and budgeting. Prerequisite: Acct 201, Econ 217, Mgt 218 and 270, or equivalents. (Fall and spring)

221 **Financial Decision Making** (3) Sachlis, Peyser, Margrabe
Theory and practice of business finance, emphasizing the impacts of long- and short-term uses and sources of funds on the firm's value. Prerequisite: BAd 120 or 220 (Fall and spring)

222 **Seminar: Capital Formation** (3) Handorf, Moran
Determinants of saving and investment and resultant funds flow are evaluated. Special emphasis on the level and risk structure and term structure of interest rates. The role and management of financial institutions is stressed. Prerequisite: BAd 120 or 220. (Fall and spring)

223 **Investment Analysis and Portfolio Management** (3) Amling, Cohen
Risk–reward analysis of security investments, including analysis of national economy, industry, company, and market; introduction to portfolio management: emphasis on theory and computer methods. Prerequisite: BAd 120 or 220. Laboratory fee. (Fall and spring)

224 **Financial Management** (3) Cohen, Barnhill
Cases in financial management; planning financial structure, obtaining and managing capital, issuing and placing securities, administering income, security arrangements. Prerequisite: BAd 221. (Fall and spring)

231 **Seminar: Investment and Portfolio Management** (3) Amling
Portfolio management theory, application, and computer modeling. Independent research on investment analysis and portfolio management with emphasis on theory, cases, and computer applications. Prerequisite: BAd 223. (Fall)

232 **Real Estate Finance** (3) Seelig
Investment in and financing of real estate from the points of view of the developer, investor, borrower, and lender. Emphasizes vocabulary and identification of significant issues. Develops key analytical tools. Prerequisite: BAd 220. (Spring)

235 **Futures Markets: Speculation and Hedging** (3) Barnhill
Organization and regulation of futures markets. Computer assistance of large data bases. Alternative strategies for profitable speculative trading of futures contracts for possible hedging uses. High risk–high return investment alternatives. The use of futures markets to manage risks caused by fluctuating interest rates, exchange rates, or commodity prices. Prerequisite: Introductory courses in economics, statistics, computer usage, and financial management. Laboratory fee. (Fall and spring)

239 **Financial Theory** (3) Peyser, Sachlis
In-depth theoretical analysis of business financial topics, including asset management, financial structure, dividend policy, and the capital asset pricing framework. Prerequisite: BAd 221, 223. Offered every third semester.

240 **Marketing Management** (3) Dyer, Divita, El-Ansary, Liebrenz, Swensen
This course is a First-Level requirement for M.B.A. students; it may not be used to satisfy a Second-Level requirement. Emphasis on the marketing process from the viewpoint of the firm. Market analysis, product planning, channels of distribution, pricing, and promotional decision making; developing an integrated marketing plan. Prerequisite: Econ 217–18. (Fall and spring)

241 **Advanced Marketing Management** (3) Divita, Liebrenz
For M.B.A. students in concentrations other than marketing. Case analysis of complex marketing problems. Current developments in marketing practice. The relationship of marketing to environmental forces and other business functions. Prerequisite: BAd 240. (Fall and spring)

242 **Buyer Behavior** (3) Dyer, Swenson, Heimbach
Examination of theory and recent research concerning buyer decision processes. Interdisciplinary behavioral science studies on individual, family, and organizational purchase behavior are treated. Present and potential applications for marketing in the public and private sector are illustrated with cases. Prerequisite: BAd 240 or permission of instructor. (Fall)

243 **Marketing Research** (3) Dyer, Swensen
The marketing research process: designing, conducting, and using market research studies. Survey and experimental designs. Data analysis with statistical software packages. Prerequisite: BAd 240, Mgt 218 and 270, or equivalent. Laboratory fee. (Fall)

246 **Product/Service Strategy** (3) Liebrenz
Management of the activities involved in marketing new and existing products and services. Product and brand management systems. The innovation system (behavioral and organizational) of product decisions, product planning processes, product auditing, new products and the law, new product service trends. Marketing of intangibles and services. Prerequisite: BAd 240, 242. (Spring)

248 **Advertising and Sales Promotion** (3) Dyer, Maddox
Examination of advertising and sales promotion from a systems perspective supported by analytical methods and concepts regarding consumer attitudes and behavior. Topics: social context of promotion, role of communication in marketing, behavioral concepts and communications research, message design, economic and financial criteria, development of a promotion program. Prerequisite: BAd 240, 242. (Spring)

250 **Selling and Sales Management** (3) Divita
The sales function from the viewpoints of the sales person and the sales manager. The first part of the course will focus on the selling task, with attention to ethical and legal issues, the selling process, human behavior and selling, account management and internal selling, negotiation and non-

selling aspects of sales work. The second part of the course will focus on the managerial issues associated with sales management, with attention to demand analysis and resource allocation, financial planning, quota setting and control, motivation, coaching and incentives, sales administration, and analysis of sales performance. Prerequisite: BAd 240. (Spring) El-Ansary

253 **Marketing Channels** (3)
Marketing channels and vertical marketing systems from a managerial viewpoint. Marketing channels viewed as super-organizations requiring planning, organization, coordination, and control. These tasks require an understanding of the channel's task environment, manufacturing, wholesaling, retailing, and physical distribution institutions. Focus on system performance and management of interorganizational relationships among channel institutions. Prerequisite: BAd 240. (Fall) Divita, Gillis

257 **Marketing and Public Policy** (3)
Examination of principal areas of public policy formulation affecting marketing practice. Topics: advertising, warranties, product safety, health issues, consumer information systems, informal and formal redress mechanisms, business responsibilities. Government, business, and advocate viewpoints presented. Prerequisite: BAd 240 or permission of instructor. (Fall) Divita, El-Ansary

259 **Marketing Strategy** (3)
Analysis of complex marketing problems involving policy and operational decisions; emphasis on creative marketing strategy. Prerequisite: completion of at least three Second-Level marketing courses or permission of instructor. (Spring) Ghadar, Grub

261 **Multinational Corporations in the World Economy** (3)
Business in the world economy; multinational corporations as economic, political, and social institutions; ownership and growth strategies, relationships to other nations; national and international controls; future of the multinational corporation. (Fall and spring) Eldridge, Edgell

262 **Seminar: International Trade** (3)
Classical and modern concepts of international trade theory, instruments and institutions of trade policy, barriers to trade, preferential treatment and trading blocs, trends and issues. (Fall and spring) Petersen

263 **Legal Aspects of International and Multinational Business** (3)
Legal environment of international and multinational business including legal systems, antitrust laws, regulation of direct investment, international arbitration and expropriation; topics of current interest. (Fall and spring) Lauter, El-Ansary

266 **International Marketing** (3)
Organizational structures. Analysis of international markets. Market-entry strategies and product policies. Special issues. Channels of distribution, promotional and price policies. Prerequisite: BAd 240. (Fall and spring) Lauter

267 **Regional International Marketing Systems** (3)
Discussion of the political, economic, legal, and social characteristics of Europe, Japan, Latin America, Asia, the Middle East, Africa, the USSR, Eastern Europe, and China, as they affect the marketing of goods and services in these regions. Identification of appropriate market-entry strategies and discussion of selected case histories. Prerequisite: BAd 266. (Fall and spring) Ghadar, Park, Askari

271 **International Business Finance** (3)
Analysis of problems in international business finance. Impact of the evolving international payments system on business. Prerequisite: BAd 120 or 220. (Fall and spring) Park, Ghadar

273 **Seminar: International Banking** (3)
International financial intermediation and international banking. Functioning of international financial markets, public policy issues in international banking, regulation of multicountry banking institutions, and the effect of international banks on national monetary policies. Prerequisite: BAd 271. (Fall and spring)

275 **External Development Financing** (3) Ghadar, Park
Problems and alternative solutions for required capital formation and the financing of payment imbalances through external sources. Institutions and instruments for financing national development. Emphasis on planning as affected by energy policies, inflation, recession, changes in the international monetary system, and revised attitudes among developed countries regarding bilateral and multilateral assistance. Prerequisite: BAd 271 or permission of instructor. (Fall and spring)

276 **Seminar: International Financial Markets** (3) Park
Theory and practice of international financial markets. Operation and structure of the Eurocurrency market, such as interbank operations, Eurodollar CDs, and floating-rate Eurocredits. Control of the Eurocurrency market and the role of other financial centers. Study of Eurobond and floating-rate note markets as well as major foreign bond markets. Prerequisite: BAd 271 or 273. (Fall and spring)

278 **International Business Negotiations** (3) Ghadar
This course focuses on the essential characteristics of International Business Negotiations (IBN) with particular emphasis on the process and changes in that process over time. Formulation of concepts and preliminary frameworks to assist in understanding IBN; development of systematic approaches to planning for and conducting IBN. The course assists in developing skills of the participants in the art of IBN while integrating other functional and international aspects in the broader environmental framework. Prerequisite: BAd 261. Laboratory fee. (Fall and spring)

280 **Purchasing and Materials Management** (3) Page, Perry, Sherman
Industrial purchasing and materials management principles and practices. Organization and functions in materials management. Determination of requirements, source selection, buying practices, policies, and ethics. Same as PAd 280. (Fall and spring)

281 **Procurement and Contracting** (3) Perry, Sherman
Principles and concepts essential to effecting large procurement programs. Planning, sourcing, and contractual design for diverse acquisitions. Emphasis on federal government policy with comparison of buying at other governmental levels and the private sector. Same as PAd 281. (Fall and spring)

282 **Government Contract Administration** (3) Sherman
Surveillance and management of contract performance. Measurement of progress; specification interpretation; quality assurance; changes, negotiation, and adjustment; financial considerations; property; terminations; regulatory and policy concerns. Same as PAd 282. (Spring)

283 **Pricing and Negotiation** (3) Sherman
Scope and objectives of negotiated procurement; preparation, conduct, and recording of negotiations; analysis of cost, price, profit, investment, and risk; cost principles; incentives; relationship of contract type to work requirements; techniques of negotiation. Same as PAd 283. (Fall)

285 **Systems Procurement and Project Management** (3) Sherman
Major systems acquisition: needs, objectives, and organizational relationships. Design, establishment, and execution of project management plans and procurement processes. Analysis of cases in public- and private-sector contractual or assistance activities. Same as PAd 285. (Fall and spring)

288 **Operations and Logistics Management** (3) Perry
(Formerly BAd 293)
Management of work in production, commercial, service, and public organizations. Analytical tools for planning and establishing operating systems and for their operation, control, and modification. Examination of processes, products, services, equipment, and facilities. Relationships of human systems and operating systems. Prerequisite: Acct 201; Mgt 218, 270; Econ 217–18; BAd 201, 220, 240. (Fall)

290 **Special Topics in Business Administration** (3) Staff
Experimental offering; new course topics and teaching methods. May be repeated once for credit.

292 **New Venture Initiation** (3) Staff
Theory and practice of entrepreneurship and small business management. Historical perspective of entrepreneurship in the U.S. and abroad, essentials of planning a new business venture, sources of financing, evaluation of alternative new business ventures, and analysis of business functions needed to get started. Ongoing firms, franchising options, and new business start-ups. Prerequisite: Mgt 218, 270; Econ 217–18; BAd 201, 220, 240; Acct 201. (Fall and spring)

295 **Research Methods** (3) Davis
Theory and practice in research methodology. Data sources and gathering, research models and designs, analysis and testing, controls, interpretation and presentation of findings. Use of computer library programs and preparation of a formal business report. (Fall)

297 **Strategy Formulation and Implementation** (3) Eastin, Davis, Thurman, Katzman
(Formerly Business Policy Formulation)
A required course for all M.B.A. students; it must be taken during the last semester of the program and may not be waived. The course provides an integrative approach to strategic management, stressing the general manager's perspective. It covers strategy formulation, implementation of strategy and policy, and evaluation and control of strategy in various types of organizations. Skills in strategic thinking and problem solving are emphasized, including scanning external environments, mobilizing and allocating organizational resources, selecting appropriate strategic alternatives, modifying organizational structures, and influencing organizational behavioral processes to facilitate achievement of the organization's purpose, goals, and objectives. Methodology includes case analyses, lectures, and decision simulations. Student ability to articulate strategic concepts is emphasized. Prerequisite: advanced master's degree standing and completion of at least eight Second-Level M.B.A. courses. (Fall and spring)

298 **Directed Readings and Research in Business Administration** (3) Staff
Supervised readings or research in selected fields within business administration. Admission by prior permission of instructor. May be repeated once for credit. (Fall and spring)

299 **Thesis Seminar** (3) Staff
Examination of thesis standards, research philosophy, and methodology. (Fall and spring)

300 **Thesis Research** (3) Staff
(Fall and spring)

Fourth Group
Fourth-group courses are primarily for doctoral students. They are offered as the demand requires. They are open to other graduate students at the discretion of the Department.

311–12 **Seminar: Public–Private Sector Institutions and Relationships** (3–3) Staff
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

321 **Seminar: Financial Markets** (3) Sachlis, Peyser, Margrabe
Research seminar in corporate financial theory, investment portfolio theory, and capital market theory. May be repeated once for credit. Prerequisite: BAd 222, 231, 239. Offered every third semester.

341 **Seminar: Marketing** (3) El-Ansary, Dyer
Examination of major theoretical developments in marketing. Topics include advances in marketing theory, services marketing, and marketing for nonprofit organizations. Emphasis on emerging concepts in consumer behavior, channels, marketing communication, and marketing information systems. Offered every third semester.

361 **Colloquium on International Business** (3) Eldridge, Ghadar
Examination of selected topics in international business, with emphasis on major new theoretical and empirical developments. (Fall)

381 **Seminar: Materials and Operations Management** (3) Perry, Sherman
Recent developments in manufacturing production and materials management; impact of technological economic and social change; significant related trends. Private- and public-sector policy implications. New and emerging analysis techniques. Prerequisite: BAd 280, 281, or permission of instructor.

391 **Seminar: Business Management** (3) Burdetsky, Eastin
Examination of major current issues, both theoretical and empirical, affecting the development of the business enterprise. Topics to be announced. Emphasis on policy and strategic issues affecting the total enterprise.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Business Administration general examination. May be repeated for credit.

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Business Administration candidates. May be repeated for credit.

CARTOGRAPHY

See **Geography and Regional Science.**

CHEMICAL TOXICOLOGY

See **Forensic Sciences** and **Chemistry.**

CHEMISTRY

Professors T.P. Perros *(Chairman)*, W.E. Schmidt, D.G. White, J.B. Levy, N. Filipescu, E.A. Caress, D.A. Rowley, D. Ramaker, M. King
Associate Professor A. Montaser
Assistant Professors J.H. Miller, M.A. Bobrik *(Visiting)*

Bachelor of Arts or Bachelor of Science with a major in chemistry (departmental)—The department offers two undergraduate majors, both designed to give students a broad background in the basic divisions of chemistry: analytical, inorganic, organic, and physical. Major I, while providing considerable concentration in chemistry, permits a wider selection of electives. It thus should meet the needs of students preparing to enter medicine, dentistry, or related fields. Major II is intended primarily for students preparing for graduate study in chemistry or those planning to enter the chemical profession and wishing to be certified to the American Chemical Society as having met the minimum requirements for professional training. One foreign language (Russian, Japanese, German, or French) is recommended for students planning to do graduate work in chemistry.

The following requirements must be fulfilled:

1. Students in either Major I or Major II must meet the general requirements stated under Columbian College of Arts and Sciences.

2. Prerequisite courses for the Bachelor of Arts degree for Major I and Major II—Chem 11–12 and 22, or 15–16; Math 31; Phys 21–22. Bachelor of Science degree candidates must also take BiSc 11–12 or a year of other approved course work in the natural sciences or mathematics.

3. (a) Required courses for Major I—Chem 111–12, 113, 122, 134 or 235, 141, 151–52, and 153–54.

(b) Required courses for Major II—Chem 111–12, 113, 122, 123, 141–42, 151–52, 153–54, 235; one approved advanced course in chemistry or a related field; Math 32; and a course in a structured computer programming language, such as Stat 129 or CSci 51.

For graduation with Special Honors in chemistry, a student must register for Chem 195 at the beginning of the senior year. The decision to award Special Honors will be based on competence in research and general achievement in chemistry, as evaluated by the faculty.

An entering student who is considering chemistry as a major is strongly encouraged to consult the Chemistry Department advisor regarding the program of study for the first two years. In general, the following sequence of courses is recommended for those students considering Major II: first year—Chem 11–12, Math 31 and 32 (or 30 and 31 if necessary), English composition, electives; second year—Chem 22, 151–52, and 153–54, Phys 21–22, Math 32 if not taken in first year, electives; third year—Chem 111–12, 113, and 141, computer programming, electives; fourth year—Chem 122, 123, 235, 142, one advanced course in chemistry or a related field, electives. Major I students should follow this sequence in general and are urged to consult with the chemistry and premedical advisors concerning their academic programs.

Bachelor of Science Master of Science in the field of chemical toxicology—This is a five-year program leading to the B.S. in the field of chemistry and M.S. in the field of chemical toxicology. The first three years of the program consist of undergraduate course work. Application for admission to the M.S. program in chemical toxicology will be made to the Graduate School of Arts and Sciences during the second semester of the third year; for admission to the graduate portion of the program, acceptance must be obtained prior to the start of the fourth year of the program. If acceptance into the M.S. program in chemical toxicology is not desired or not obtained, the requirements for the B.S. in chemistry, either Major I or II, may be fulfilled by the successful completion of appropriate courses during the fourth year of study. If acceptance into the M.S. program in chemical toxicology is obtained, the B.S. in chemistry will be awarded after the successful completion of the fourth year of the program.

The following requirements must be fulfilled:

1. Students must meet the general requirements stated under Columbian College of Arts and Sciences and the Graduate School of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the humanities and social sciences.)

2 Course Requirements: Chem 11–12, 22, 111–12, 113, 122, 123, 141–42, 151–52, 153–54, 235; Phys 21–22; BiSc 11–12; Math 31, 32; Stat 127 and a course in a structured computer programming language; Phar 203; Bioc 221–22; Phyl 191; ForS 240, 245, and 242 or 270; either ForS or Chem 299–300; and two courses chosen from ForS 246, 248, 249, 269.

Minor in Chemistry—Required: Chem 11–12, 22, 50, and 110 or 111; Chem 151–52 and 153–54 may be substituted for Chem 50.

Master of Science in the field of chemistry—Prerequisite: a bachelor's degree with a major in chemistry from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The required 30 semester hours of graduate work must include Chem 213 and 221 and at least two of the following: Chem 207, 236, and 251. The thesis requirement, Chem 299–300, may be in analytical, inorganic, organic, or physical chemistry. Chem 156, or its equivalent, is prerequisite to research work in the field of organic chemistry. A reading knowledge examination in German or Russian must be passed, or proficiency in computer programming must be demonstrated. A student who intends to become a doctoral candidate is strongly urged to take Chem 207 as early as possible in the master's program.

Master of Science in the field of geochemistry (an interdepartmental degree offered by the Departments of Chemistry and Geology)—Prerequisite: a bachelor's degree with a major in chemistry or geology from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including Chem 111–12, 213, and 299–300, and Geol 141, 241, and 249. The Master's Comprehensive Examination must be taken before registration for the second half of the thesis work. A reading knowledge examination in a foreign language, approved by the Department of Chemistry or Geology must be passed prior to beginning the third semester of graduate work or before beginning the thesis work, whichever occurs first.

Doctor of Philosophy in the field of chemistry—Required: the general requirements stated under the Graduate School of Arts and Sciences. Chem 207, 213, 221, 235, 251, and 350 are normally required of the doctoral student, in addition to other courses as determined by consultation with the departmental program committee. A reading knowledge examination in German or Russian must be passed, and proficiency in computer programming must be demonstrated. Cumulative examinations replace the General Examination requirement.

Research fields: analytical chemistry, forensic chemistry, inorganic chemistry, organic chemistry, physical chemistry, physical organic chemistry, and structure and synthesis of natural products.

Ph.D. students in chemistry may substitute up to 12 hours of Dissertation Research (Chem 399) in the form of course work jointly approved by the Chemistry Department and the Graduate Program in Science, Technology, and Public Policy. The purpose of this option is to provide a useful background for chemistry doctoral students who may be employed in government agencies dealing with science, technology, and public policy programs. The 12 hours may be selected from the following courses: PSc 203, 217, 222, 223, 252; PAd 214, 260; Mgt 233, 234.

Doctor of Philosophy in the field of geochemistry (an interdepartmental degree offered by the Departments of Chemistry and Geology)—Required: the general requirements stated under the Graduate School of Arts and Sciences, including a reading knowledge examination in an approved foreign language plus the satisfactory completion of Stat 118 and 119, or 91, and the satisfactory completion of the General Examinations in four fields, including chemistry and geochemistry.

Bachelor of Arts in Education and Human Development with a teaching field in chemistry—Prerequisite: the education curriculum; required: the chemistry option and professional courses stated under the School of Education and Human Development.

Graduate Placement Examinations: All entering students in the master's and doctoral programs in the field of chemistry are required to take the American Chemical Society Graduate Level Placement Examinations, given by the Department of Chemistry, prior to registration in the Graduate School of Arts and Sciences. The four placement examinations (in the disciplines of analytical, organic, inorganic, and physical chemistry) are of the multiple-choice type. These tests are designed to cover the subject matter in the disciplines generally taught in modern undergraduate programs preparatory for graduate work in chemistry, and the results are used by the department to advise the individual student in planning a program of courses appropriate to the student's background.

All graduate students are required to participate in the seminar and colloquium programs.

Registration: Before completing registration each student must obtain from the representative of the department an assignment to lecture, recitation, and laboratory sections.

PHYSICAL SCIENCE

First Group

3–4 **Contemporary Science for Nonscience Majors** (3–3) Filipescu
Lecture (2 hours), laboratory (3 hours). Contemporary topics in physical, biological, and medical science. Chem 3 is not prerequisite to Chem 4, but both courses must be satisfactorily completed to fulfill the meaningful initiation requirement. Laboratory fee, $20 per semester. (Academic year)

CHEMISTRY

First Group

11–12 General Chemistry (4–4) Perros, Rowley, White
Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Elementary course in general chemistry, including qualitative analysis. Prerequisite to Chem 11: one year of high school algebra. Prerequisite to Chem 12: Chem 11. Laboratory fee, $35 per semester. (Chem 11 and 12—fall and spring)

13 General Chemistry (4) Staff
For engineering and applied science students only. Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Atomic structure, chemical bonding; chemical equations; acids and bases; chemical equilibrium; liquid and solid states; periodicity; electrochemistry. Prerequisite or concurrent registration: Math 31, Phys 14. Laboratory fee, $35. After completion of Chem 13, Chem 11–12 may not be taken for credit. (Fall and spring)

15–16 Intensive General and Analytical Chemistry (4–4) Staff
(Honors Course)
Chem 15: Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Chem 16: Lecture (2 hours), laboratory (6 hours), recitation (1 hour). Equivalent to Chem 11–12 and 22, but with selected topics studied in depth. Prerequisite to Chem 15: high school physics and chemistry. Prerequisite to Chem 16: Chem 15. Admission by placement test prior to registration or on basis of College Board Advanced Placement Examination. Laboratory fee, $35 per semester. (Academic year)

22 Introductory Quantitative Analysis (5) Staff
Lecture (3 hours), laboratory (6 hours). Theory and practice of quantitative analysis by classical and modern methods; evaluation of analytic data emphasizing detection and correction of experimental errors. Prerequisite: Chem 12 or 16. Laboratory fee, $35. (Fall and spring)

50 Introduction to Organic Chemistry (4) Caress
Lecture (3 hours), laboratory (3 hours). A terminal course for students in related disciplines. This course does not fulfill the organic chemistry requirement for chemistry majors or premedical students. Prerequisite: Chem 12 or 16. Laboratory fee, $35. (Spring)

Second Group

110 Introduction to Physical Chemistry (3) Staff
Topics include chemical thermodynamics, chemical kinetics, electrochemistry, solution chemistry, membrane and phase equilibria, and others. Prerequisite: Chem 16 or 22; Math 31; Phys 2 or 22; or permission of instructor. Not open to chemistry majors. May not be taken for credit by students who have received credit for Chem 111–12 or an equivalent course.

111–12 Physical Chemistry (3–3) Miller, Ramaker
Gas laws, chemical thermodynamics, chemical equilibrium, kinetics, quantum chemistry, atomic and molecular spectra, structure of solids, liquids, and macromolecules. Prerequisite to Chem 111: Chem 16 or 22; Math 31; Phys 21, 22; or permission of instructor. Prerequisite to Chem 112: Chem 111. (Academic year)

113 Physical Chemistry Laboratory (2) Miller, Montaser, Schmidt
Laboratory complement to Chem 111. Prerequisite or concurrent registration: Chem 111. Laboratory fee, $35. (Fall)

122 Instrumental Analytical Chemistry (3) Montaser
Theory of instrumental methods in qualitative and quantitative analysis, determination of structure, with emphasis on electroanalysis, atomic and molecular spectrophotometry, mass spectrometry, and chromatography. Correlated with Chem 123. Prerequisite or concurrent registration: Chem 112 or permission of instructor. (Spring)

123 **Instrumental Analytical Chemistry Laboratory** (2) — Miller, Montaser, Schmidt
(Formerly Chem 114)
Laboratory complement to Chem 122. Prerequisite or concurrent registration: Chem 112, 113, and 122. Laboratory fee, $35. (Spring)

134 **Descriptive Inorganic Chemistry** (2) — Perros
Intermediate-level course emphasizing the descriptive chemistry of the elements. Prerequisite: Chem 16 or 22, 152. (Fall)

141–42 **Advanced Experimental Chemistry** (3–2) — White, Caress
Chem 141. Experimental methods common to all disciplines of chemistry, use of the chemical literature, interpretation of spectra by correlation methods, and operation of basic chromatographic and spectroscopic instrumentation. Chem 142: Advanced organic and inorganic laboratory techniques. Emphasis on individual work and on sophisticated methods for the separation, characterization, and identification of compounds. Prerequisite: Chem 154. Prerequisite or concurrent registration: Chem 111 or permission of instructor. Laboratory fee, $35 per semester. (Academic year)

151–52 **Organic Chemistry** (3–3) — Levy, King
Chemistry of the compounds of carbon. Prerequisite to Chem 151: Chem 12 or 16. Prerequisite to Chem 152: Chem 151. (Academic year)

153–54 **Organic Chemistry Laboratory** (1–1) — Staff
Laboratory complement of Chem 151–52. Prerequisite or concurrent registration: Chem 151–52. Prerequisite to Chem 154: Chem 153. Laboratory fee, $35 per semester. (Academic year)

156 **Qualitative Organic Analysis** (3) — King
Lecture (1 hour), laboratory (6 hours). Separation of mixtures such as essential oils, peptides, commercial pharmaceuticals, carbohydrates, and/or others as appropriate; identification of their components using spectroscopic techniques. Lecture emphasizes the practical considerations in separation methods (including GLPC, TLC, and HPLC) and the spectral interpretation of unknown substances. Prerequisite: Chem 16 or 22, 154. Laboratory fee, $35. (Spring, odd years)

191 **History of Chemistry** (2 or 3) — Perros
Historical development of chemistry from antiquity to the 20th century. Prerequisite: Chem 12 or 16. (Spring)

193 **Chemical Instrumentation** (3) — Montaser
Lecture (2 hours), laboratory (3 hours). Electronic analog measurements and control of electrical quantities in chemical instrumentation; digital and analog data conversion and optimization of electronic measurements in chemical instrumentation. Prerequisite: Chem 112 and 123 or permission of instructor. Laboratory fee, $10. (Spring)

195 **Undergraduate Research** (1 or 2) — Staff
Research on problems approved by the staff. Approval must be obtained prior to registration. May be repeated once for credit. Laboratory fee, $35 per semester hour. (Fall and spring)

Third Group

201–2 **Interdisciplinary Science** (4–4) — Levy, Merchant, Parke
Joint offering of the Departments of Biological Sciences, Chemistry, and Physics. A treatment of scientific methodology and knowledge, both principles and facts. Designed to provide a basic understanding of the natural sciences and the nature of science itself. Overview of the known fundamental principles developed in scientific observation of the physical universe. Fundamental principles are applied to systems of increasing complexity, with emphasis on physical, chemical, and biological systems. Students enrolled in natural science programs may not take this course for credit. Prerequisite: high school algebra or equivalent.

205 **Environmental Science and Technology** (3) Ramaker
Chemistry and physics of environmental pollution; emphasis on water and air pollution. Instrumental techniques and their limitations. Students present papers emphasizing chemical and physical aspects of an environmental pollutant. Offered off campus.

207 **Chemical Bonding** (3) Miller, Ramaker
Quantum mechanics, approximate methods, electron spin, Pauli principle, atomic and molecular structure. Prerequisite: Chem 112. (Fall)

211–12 **Physical Chemistry** (2–1) Miller
Same as Chem 111–12. Admission only by departmental permission. Credit assigned upon satisfactory completion of Chem 213. (Academic year)

213 **Chemical Thermodynamics** (3) Ramaker
Application of thermodynamics to chemical problems. Emphasis on statistical calculation of thermodynamic properties. Prerequisite: Chem 112 or 212. (Spring)

218 **Molecular Spectroscopy** (3) Montaser
Applications of quantum chemistry, molecular orbital theory, valence bond theory, vibration and rotation of molecules, IR and electronic spectroscopy. Prerequisite: Chem 207. (Spring, odd years)

221 **Advanced Analytical Chemistry I** (3) Schmidt
Theory and application of recent spectrometric methods of analysis, including electrical, magnetic, and optical instrumentation, X-ray methods, and surface analysis techniques. Prerequisite: Chem 122. (Fall)

222 **Advanced Analytical Chemistry II** (3) White
Theory and application of electroanalysis and separations by physiochemical methods. Prerequisite: Chem 122. Laboratory fee, $21. (Spring, even years)

233 **Organometallic Chemistry** (3) Rowley
Survey of organometallic compounds, with emphasis on the compounds of lithium, boron, aluminum, silicon, and the transition metals and the catalytic role of certain organotransition metal complexes. Prerequisite: Chem 235 and 251, or permission of instructor. (Spring, even years)

235–36 **Advanced Inorganic Chemistry** (3–3) Filipescu
Application of modern chemical theories to inorganic substances and reactions followed by a detailed study, developed from the periodic table, of the chemistry of the more common elements. Prerequisite to Chem 235: Chem 112, 152. Prerequisite to Chem 236: Chem 235. (Academic year)

251–52 **Advanced Organic Chemistry** (3–3) Levy
Synthesis, reactions, and properties of organic compounds; fundamental theories of organic chemistry, emphasis on reaction mechanisms. Prerequisite to Chem 251: Chem 112, 152. Prerequisite to Chem 252: Chem 251. (Academic year)

257 **Physical-Organic Chemistry** (3) Caress
The transition state theory of chemical kinetics, applications to reaction mechanisms, kinetic isotope effects, linear-free energy relationships, concentrated and "super" acids, Woodward–Hoffman rules, free radical reactions. Prerequisite: Chem 252 or permission of instructor. (Fall, odd years)

258 **Synthesis and Structure Determination in Organic Chemistry** (3) Barkin
Spectroscopic methods of structure determination; the design of synthesis for complex organic molecules. Prerequisite: Chem 251 or permission of instructor. (Fall, even years)

259 **Polymer Chemistry** (3) Staff
A study of the preparation, properties, and structure of macromolecules. Prerequisite: Chemistry 152 and 110 or 111 or permission of instructor. (Fall)

295 **Research** (arr.)
Research on problems approved by the staff. Open to qualified students with advanced training. May be repeated for credit not to exceed a total of 8 semester hours. Laboratory fee, $35 per semester hour. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

350 **Choice and Design of a Research Problem** (1) Staff
Development in written form of an original research plan, fully referenced, and its oral defense. If a grade of C is received, the student must repeat this course for credit and must develop a new research plan. (Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy cumulative examinations. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

CHINESE

See **East Asian Languages and Literatures.**

CLASSICS

Associate Professors J.E. Ziolkowski *(Chairman)*, E.A. Fisher
Assistant Professors M.D. Ticktin, D.N. Wigtil *(Visiting)*
Assistant Professorial Lecturer Y.M. Moses

Bachelor of Arts with a major in classical humanities (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Clas 1–2, 3, 4; or equivalent; or Clas 11–12, 13–14; or equivalent; and Clas 71, 72. Students may substitute for Clas 3, 4, or 13–14 two additional courses (6 semester hours) consisting of Clas 64 and a course to be selected in consultation with the departmental advisor.
3. Required courses in the major—(a) 12 semester hours selected from second-group classics courses; (b) 18 semester hours selected from Art 101, 102, 103, 112, 155; Hist 105, 107, 108, 109, 110, 111, 209; Phil 111; PSc 105; Rel 143.

Bachelor of Arts with a major in classical archaeology and classics (departmental)—An interdepartmental major arranged in conjunction with the Department of Art. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the natural and mathematical sciences.)
2. Prerequisite courses—Clas 1–2, 3, 4; or Clas 11–12, 13–14.
3. Required courses in the major—Art 101, 102, 112, 155; three courses selected from Hist 107, 108, 109, 110, 209; 6 semester hours in second-group courses in Greek or Latin. (A reading knowledge of French and German is recommended.)

Minor in classical humanities—(a) 6 semester hours selected from Clas 1–2 or 11–12; (b) 9 semester hours selected from Clas 3, 4, 13, 14, 71, 72, 105, 108, 113, 127, 134, 170, 185, 186; (c) 6 semester hours selected from Art 101, 102, 103, 111; Hist 107, 108, 109, 110.

COURSES IN GREEK, HEBREW, LATIN, AND YIDDISH

First Group

1–2 **Beginning Latin** (3–3) Ziolkowski
A year course; credit toward a degree at this University given on completion of Clas 2. Grammatical essentials of the language, appropriate reading

selections, development of English derivatives, introduction to Roman life and literature. (Academic year)

3 **Intermediate Latin: Prose and Poetry** (3) Ziolkowski
Development of ability to read and understand Latin literature of moderate difficulty. Prerequisite: Clas 1–2 or equivalent. (Fall)

4 **Vergil's *Aeneid*** (3) Ziolkowski
Significant passages of Vergil's famous epic—in Latin; reading and discussion of the entire poem in translation. Prerequisite: Clas 3 or permission of instructor. (Spring)

11–12 **Beginning Greek: Classical** (3–3) Wigtil
A year course; credit toward a degree at this University given on completion of Clas 12. Study of the grammar, vocabulary, and structure of Greek. Reading of selected ancient authors. (Academic year)

13–14 **Intermediate Greek: Classical** (3–3) Wigtil
Review of grammar; extensive reading of prose and poetry: e.g., Homer, Herodotus, or a play. (Academic year)

21–22 **Beginning Hebrew** (3–3) Moses
A year course; credit toward a degree at this University given on completion of Clas 22. Grammatical essentials of the language; readings selected from classical and modern texts; basic audio-lingual drills for comprehension and expression. Laboratory fee, $30 per semester. (Academic year)

23–24 **Intermediate Hebrew** (3–3) Ticktin
Intensive readings and text analysis, with opportunities to develop basic skills. Materials range from Israeli newspapers and scholarly journals to liturgical poetry and rabbinic narratives. Laboratory fee, $30 per semester. (Academic year)

25–26 **Yiddish for Reading and Conversation** (3–3) Ticktin
Grammatical essentials of the language, appropriate reading selections, conversational exercises for beginners. (Academic year)

Second Group

103 **Modern Hebrew Nonfiction** (3) Ticktin
Directed readings in humanities and social sciences. Development of linguistic skills necessary for independent research. May be repeated for credit. (Fall)

104 **Modern Hebrew Fiction** (3) Ticktin
Study of selected modern Israeli short stories and poems. May be repeated for credit. (Spring)

109–10 **Major Latin Authors** (3–3) Ziolkowski
Selections from one or two major authors will be read each semester. May be repeated for credit. Prerequisite: Clas 3, 4; or permission of instructor. (Academic year)

134 **Medieval Latin** (3) Andrews
Selections from the Vulgate and representative Latin writers through the 11th century. Prerequisite: Clas 3, 4; or permission of instructor. May be taken for graduate credit with approval of instructor. (Spring)

139–40 **Major Greek Authors** (3–3) Staff
Selections from a wide variety of Greek prose, drama, and poetry, suited to the needs of the class. May be repeated for credit with permission of instructor. Prerequisite: Clas 14. (Academic year)

185–86 **Directed Reading** (1, 2, or 3) Staff
Advanced reading in Greek, Hebrew, or Latin. Admission by permission of instructor. May be taken for graduate credit.

COURSES IN ENGLISH TRANSLATION

First Group

63 **Greek and Latin Origins of Medical Terms** (3) Staff
Mastery of medical terminology by learning word elements from Greek and Latin and the principles that govern both the formation of medical words and the derivation of their meanings. (Fall)

64 **Greek and Latin Origins of English Words** (3) Staff
Study of Greek and Latin elements in English to improve vocabulary and facilitate understanding of the language of science, philosophy, politics, etc. (Spring)

71 **Greek Literature and Civilization** (3) Ziolkowski
Study of ancient Greek civilization with focus on public and private life as seen primarily through literature. (Fall)

72 **Roman Literature and Civilization** (3) Wigtil
Study of Roman civilization with focus on public and private life as seen primarily through literature. (Spring)

100 **Modern Hebrew Literary Classics** (3) Ticktin
Prose and poetry of a century of writing from the beginning of the Hebrew literary renaissance to contemporary Israeli literature, including works of Bialik, Agnon, Peretz, Hazaz, Amichai, and Oz.

Second Group

101 **Israeli Society and Culture: Literary Perspectives** (3) Ticktin
A study of literature reflecting such contemporary issues as the conflict between the "builders' generation" and their children; the cultural contacts of Ashkenazim and Sefardim; image of the Arab; impact of the Holocaust; Zionist ideals and current realities. (Fall)

102 **Contemporary Israeli Short Stories and Poetry** (3) Ticktin
An introduction to post-1948 writers, including A.B. Yehoshua, Amos Oz, David Shahar, Aharon Apfelfeld, Dahlia Ravikovitch, Yehuda Amichai, Haim Gury, Amir Gilboa, and Amalia Kahana-Karmon. (Spring)

105 **Special Topics in Classical Literature** (3) Staff
Focus on a selected topic, such as athletics in classical antiquity or the hero, or on study of a genre, such as satire or oratory. May be repeated for credit.

108 **Classical Mythology** (3) Wigtil
Mythology of the Greeks and Romans from the creation of the world: tales of the gods, heroes, and great families that have influenced literature, art, and music. (Fall)

113 **Greek and Roman Drama** (3) Staff
Selected masterpieces of Greek and Roman tragedy and comedy. (Spring)

127 **Classical Influence on Western Civilization** (3) Ziolkowski
A survey of Greek and Roman influence on Western civilization relevant to modern America: literature, art, law, science, philosophy, etc.

170 **Women in Classical Antiquity** (3) Staff
In-depth study and discussion of readings from ancient and modern sources on the role of women in Greek and Roman society.

COMMUNICATION AND THEATRE

Professors W.M. Reynolds, L.S. Bielski, C.H. Sterling
Associate Professors J.E. Thiel, A.G. Wade *(Chairman)*, R.S. Fortner *(Director of Radio and Television)*
Assistant Professors N.C. Garner, S. Keller *(Director of Speech Communication)*, B.W. Sabelli, L.B. Jacobson *(Director of Theatre)*, W.A. Pucilowsky, W.J. Balling, Jr., R.W. Gustafson, L.A. Nielsen *(Visiting)*

Bachelor of Arts with a major in speech communication (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation in the social sciences and the natural and mathematical sciences.)
2. Prerequisite courses—CmTr 1, 11.
3. Required courses in related areas—12 semester hours in psychology and/or philosophy as approved by the major advisor; 18 semester hours in a single subject area outside the Department of Communication and Theatre as approved by the major advisor.
4. Required courses in the major—CmTr 112, 121, 126; 15 additional semester hours of second-group courses in the Communication and Theatre Department as approved by the major advisor.

*Bachelor of Arts with a major in radio–television (departmental)**—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation in the social sciences and the natural and mathematical sciences.)
2. Required courses in related areas—18 semester hours in a single subject area outside the Communication and Theatre Department as approved by the major advisor.
3. Required courses in the major—CmTr 1, 11, 55, 75, 133, 134, 145, and 199. (CmTr 199 will first be offered in fall 1986; it is required of those majors who are in residence at that time and thereafter.) Eighteen hours of second-group radio–television or film courses as approved by the major advisor.

Bachelor of Arts with a major in theatre (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation in the social sciences and the natural and mathematical sciences.)
2. Required courses in related areas—24 semester hours of second-group courses outside the Department of Communication and Theatre as approved by the major advisor (including 12 semester hours in dramatic literature).
3. Required courses in the major—CmTr 1, 11, 114, 151, 152, 154, 165–66, 195; 15 additional semester hours in second-group theatre courses.

Minor in speech communication—18 semester hours of communication and theatre courses, including CmTr 1, 11, 112, 121, and 126.

Minor in theatre—18 semester hours of communication and theatre courses, including CmTr 114, 151, 154, 165–66, and one other theatre course on the 100 level or above.

Master of Fine Arts in the field of theatre—Prerequisite: the degree of Bachelor of Arts from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences.

For the concentration in acting, the program of study consists of (1) 30 semester hours of second- and third-group course work planned in consultation with the advisor; (2) a creative thesis (equivalent to 6 additional semester hours) in the selected area of concentration. Each candidate is expected to complete the program in residence in four continuous semesters.

For the concentration in theatre design, the program of study consists of (1) 48 semester hours of second- and third-group course work in communication and theatre, art, and human kinetics and leisure studies, planned in consultation with the advisor; (2) a creative thesis (equivalent to six additional semester hours) in the area of concentration. Each candidate is expected to complete the program in residence in six continuous semesters.

* Admission to this major may be on a selective or space-available basis.

Bachelor of Arts in Education and Human Development with a teaching field in communication and theatre—Prerequisite: the education curriculum; required: the communication option and the professional courses stated under the School of Education and Human Development.

First Group

1 **Speech Communication** (3) Keller and Staff
The study and practice of the basic principles and techniques of public speaking used to inform and persuade audiences. Emphasis on the speech building process: research, composition, organization, style, delivery, and criticism. Laboratory fee, $5. (Fall and spring)

2 **Interpersonal Communication** (3) Staff
Study of the role of verbal and nonverbal communication in spontaneous, face-to-face encounters and interviews. Role playing, models, and simulations. (Fall and summer)

11 **Voice and Diction** (3) Bielski and Staff
Development of naturalness, correctness, and clarity in conversation through the study of phonetics, rate, volume, pitch, and quality in preparation for performance. Recording fee, $5. Same as SpHr 11. (Fall and spring)

30 **Television's View of America** (3) Fortner
The role of television entertainment and news programming in portraying the American people and interpreting their values and aspirations, their faults and frailties, their successes and failures, their heroes and villains. (Summer)

45 **Understanding the Theatre** (3) Sabelli
The art of the theatre; its literature, architecture, aesthetics, and mechanics. Contributions of the playwright, actor, director, and designer examined through lectures and class discussion. Attendance at theatrical performances and presentations by visiting artists. Primarily for nonmajors. (Fall and spring)

49 **Rhetoric in Political and Social Action** (3) Keller
Study of the use and abuse of rhetoric in contemporary political and social movements. Theories of persuasion and agitation, as well as means of support considered in various case studies including civil rights and antiwar protests. (Fall)

55 **Introduction to Electronic Mass Media** (3) Fortner
Introduction to theory, forms, content, research, and societal role of American broadcasting and newer media as a process in communication. The course provides a context for studies in journalism, management, sociology, political science, and economics. (Fall and spring)

75 **Sight and Sound** (3) Thiel
Development of a critical awareness of aural and visual communication through an introduction to the aesthetics, techniques, and organization of the creative process in electronic media. Lecture (2½ hours), laboratory (2 hours). Prerequisite: permission of instructor for nonmajors. Laboratory fee, $10. (Fall and spring)

Second Group

105–6 **The Writing of Plays** (3–3) Claeyssens
Same as Engl 105–6.

109 **Shakespeare in Performance** (3) Wade
The study of Shakespeare's plays in and through performance. Students view selected productions of the BBC-TV Shakespeare series, attend a Folger Theatre Group production, and perform scenes from the plays. Prerequisite: permission of instructor. (Summer)

110 **Performance of Literature** (3) Wade
Theory and technique of the interpretation of nondramatic literature through

performance. Performance of poetry and prose fiction. Prerequisite: CmTr 11, Engl 9 or 10. (Spring)

111 **Business and Professional Speaking** (3) Reynolds and Staff
Study of the communication process in business and professional organizations; practice in interviewing, small group communication, and speeches for special occasions. Primarily for nonmajors. (Fall and spring)

112 **Persuasion** (3) Keller
In-depth study of the principles and techniques of persuasion, focusing on theory and practice. Emphasis is placed on the common-premise model while considering factors of image, support materials, emotion, audience analysis, and style. Prerequisite: CmTr 1 or permission of instructor. (Spring)

113 **Voice for the Theatre** (3) Wade
The practice and application of voice production in four areas: skeletal alignment, breathing, resonance, and articulation. Emphasis is placed on individual awareness of the process of voice production and its application to performance. Prerequisite: CmTr 11. (Fall)

114 **Introduction to Acting** (3) Jacobson, Garner
Basic techniques of concentration, imagination, improvisation, and character analysis. (Fall and spring)

115 **Scene Study: Modern Realism** (3) Jacobson
Principles of role development, concentrating on 20th-century material, including Chekhov, Williams, and Miller. Prerequisite: CmTr 114. (Fall, even years)

116 **Scene Study: Modern Comedy** (3) Garner
Principles of role development, comic timing, and stage business, concentrating on material by contemporary playwrights such as Neil and Simon. Prerequisite: CmTr 114. (Spring, odd years)

117 **Audition Techniques** (1) Jacobson
The course examines all aspects of the audition process: selection and rehearsal of audition monologues, handling of cold reading, etc. Prerequisite: CmTr 114 or equivalent. (Spring)

121 **Small Group Communication** (3) Staff
The study and practice of communication in small groups focusing on problem solving, norms, roles, and leadership. Prerequisite: CmTr 1 or permission of instructor. (Fall and spring)

122 **Scene Study: Classical Drama** (3) Garner
Principles of role development and handling of verse dialogue, concentrating on classical Greek and Shakespearian drama. Prerequisite: CmTr 114. (Fall, odd years)

123 **Scene Study: Classical Comedy** (3) Garner
Principles of role development, concentrating on material from the English Restoration, Molière, and other 17th- and 18th-century playwrights. Prerequisite: CmTr 114. (Spring, even years)

126 **Argumentation and Debate** (3) Reynolds
Study of the advocacy process, with emphasis on issue identification, use of evidence, and logical proof. Practice in oral advocacy and argumentative speaking. Prerequisite: CmTr 1 or permission of instructor. (Fall)

127–28 **Forensic Practice** (1–1) Keller
Student participation in intercollegiate speech activities. May be repeated for a total of 4 semester hours of credit. Admission by permission of instructor. (Fall and spring)

129 **TV News: The Politics of Visibility** (3) Lichter
Same as PSc 129.

132 **Radio–Television Performance** (3) Staff
Introduction to the basic theories and techniques required for effective, nondramatic media performance (i.e., announcing, moderating, newscasting, etc.). Prerequisite: CmTr 1, 11, or 110. (Spring and summer)

133 **Development of American Electronic Media** (3) Fortner
Study of the origins, structure, and nature of American broadcasting and related media. Prerequisite: CmTr 55. (Spring)

134 **Audio Production** (3) Staff
Introduction to the basic concepts of radio as a communication medium; emphasis on the design and production technique of a variety of audio programs. Lecture (2½ hours), laboratory (2 hours). Prerequisite: CmTr 75 (for radio–television majors) or permission of instructor. Laboratory fee, $10. (Fall and spring)

135–36 **Radio Workshop** (1–1) Staff
Theory and practicum in radio operations. Admission by permission of instructor. May be repeated for a total of 4 semester hours of credit. (Academic year)

137 **Scriptwriting** (3) Staff
Study and practice of the forms, techniques, and types of writing for radio, television, and film. Prerequisite: Engl 11 or 12, and CmTr 75 (for radio–television majors) or permission of instructor. (Fall)

138 **Scriptwriting: Selected Topics** (3) Wade
Intensive study and practice of a specific genre of radio, television, and film writing. Topics may include adapting the literary text, series and serials, and anthology drama. Prerequisite: Engl 11 or 12, and CmTr 75 (for radio–television majors) or permission of instructor. (Spring, even years)

139 **The Music Business** (3) Gustafson
Seminar on the history, selection, promotion, and production of popular music by the American recording industry. (Summer)

141 **Negotiations and Conflict Resolution** (3) Keller
Communications factors involved in negotiation and conflict resolution. Use of models and simulations to explore prominent-solution approach to conflict situations. (Summer)

142 **Topics in Electronic Media** (3) Staff
An in-depth study of specific topics and/or controversial issues. (Summer)

143 **Origins of Contemporary Rhetorical Theory** (3) Reynolds
Study of rhetorical theory and method as they evolved in the Western world from the classical period to the present. (Fall, even years)

144 **History and Criticism of American Public Address** (3) Reynolds
Study of American oratory from its pre-Revolution origins to the present day, interpreted in terms of issues and movements. (Spring, odd years)

145 **Introduction to Television Production** (3) Gustafson
Basic course in television production techniques and skills. Directing, scriptwriting, graphics, and other aspects of television production. Extensive practice in working television equipment; emphasis on various in-studio projects. Lecture (2 hours), laboratory (2½ hours). Prerequisite: CmTr 134. Laboratory fee, $10. (Fall)

146 **Television Directing** (3) Thiel
Advanced study and practice of television directing techniques. Students are expected to demonstrate skill in working with studio and electronic field production equipment and in the development of television programs from original concepts to final productions. Lecture (2 hours), laboratory (3 hours). Prerequisite: CmTr 145 and permission of instructor. Laboratory fee, $10. (Spring)

147 **Innovations in Electronic Media** (3) Fortner
Examination of current and future trends in electronic media, with emphasis on radio, television, and cable, including developments in technology, programming, industry structure, and public policy. Prerequisite: CmTr 55 or 133. (Fall)

148 **Program Design and Development** (3) Gustafson
Close examination of the role of the producer in the television industry.

Emphasis on both the creative and executive decision-making aspects of producing. Prerequisite: CmTr 145 or permission of instructor. (Spring)

149 **Theory and Effects of Electronic Media** (3) Fortner
Current concepts of the impact of broadcasting and related media on audiences: social science research findings and methods, including persuasion, formation of opinion, media and personal interaction, violence, audience characteristics and media use patterns, and development of related theories and models of mass communication. Prerequisite: CmTr 55 or 133. (Spring)

151 **Theatre Production** (3) Balling
Theories and practicum in theatre production, including acting, stage management, costume and set construction, rigging, lighting, sound, make-up, business management, and publicity, with specific emphasis in at least one area. May be repeated once for credit. (Fall and spring)

152 **Introduction to Lighting** (3) Balling
Lecture (2 hours), laboratory (1 hour). Theories and practicum in lighting for performance media. Laboratory fee, $15. (Fall and spring)

154 **Directing for the Theatre** (3) Garner
Fundamentals of script analysis, casting, and rehearsal techniques. Prerequisite: a course in acting or interpretation and a course in theatre history or dramatic literature. Laboratory fee, $15.

156 **Make-Up Design** (3) Pucilowsky
Theory and practicum in the art of make-up design, including prosthesis, mask making, latex. (Fall)

157 **Stage Management** (1) Sabelli
Fundamental study of stage management with emphasis on practical production work, as well as theory. (Fall and spring)

158 **Theatre Architecture** (1) Sabelli
Study of general principles, theories, and styles of theatre architecture.

163 **Musical Theatre** (3 to 6) Sabelli, Jacobson
Growth of American musical theatre. Development of all its components: libretto, dance, composition, lyrics, and the overall fabric of production. (Summer)

165–66 **History of the Theatre** (3–3) Pucilowsky
An examination of the development and growth of the theatre from its beginnings to the present. CmTr 165: Greek through Restoration. CmTr 166: the 18th century to the present. (Academic year)

171 **Language of Cinema** (3) Staff
Introduction to cinema as language through analysis of the components of film structure—camera, editing, sound, movement, music, dialogue, and mise-en-scène. Laboratory fee, $25. (Fall)

172 **Film Directors and Styles** (3) Staff
Examination of influence on major film directors of twentieth-century art movements: German expressionism, Soviet constructivism, surrealism, neorealism, and structuralism. Comparison of film narrative with styles in dramatic and visual art forms. Laboratory fee, $25. Prerequisite: CmTr 173 (Fall)

173 **History of Cinema** (3) Staff
An examination of the history, structure, and theory of motion pictures in America and abroad. Same as Art 173. Laboratory fee, $25. (Fall)

174 **Special Studies in Film** (3) Staff
In-depth study of specific film topics. Laboratory fee, $25. Prerequisite: CmTr 173. (Spring)

175 **The Political Image** (3) Staff
An analysis of the techniques of propaganda and rhetoric used in film and television to visualize political ideology. Laboratory fee, $25. (Spring, even years)

176 **Film as Fact and Fiction** (3) Staff
A comparison of structural differences between documentary and fiction film in order to study how each presents different versions of reality. Laboratory fee, $25. (Spring, odd years)

180 **Regulation and Policy in Electronic Media** (3) Sterling
Legal, technical, political, economic, and social aspects of radio, television, and cable and related delivery systems. Structure and operation of FCC and other agencies, plus role of Congress and courts. Consideration of problems in spectrum allocation, behavioral regulation, the trend to deregulate political influence, and current policy matters. Prerequisite: CmTr 55 or 133. (Fall)

181 **Inside Television: Corporate Strategy and Management** (3) Gustafson
Seminar on the operations and decision-making activities of the television industry: networks, affiliates, independent stations, public television, and cable/satellite organizations. Topics include programming, sales, representation, promotion, ratings, and legal constraints. Prerequisite: CmTr 55 or 133. (Spring)

185 **Comparative Communication Systems** (3) Fortner
In-depth study of the developmental, regulatory, political, economic, and cultural dimensions of selected foreign communication systems; emphasis on broadcasting, cable, and satellite applications. Prerequisite: CmTr 55 or 133. (Spring)

186 **Internship: Radio and Television** (3) Thiel
Open to seniors majoring in radio–television. Students will spend at least 16 hours a week during the semester in an approved media position with local nonprofit, corporate, or commercial organizations. Seminar meetings, reports, and career-oriented projects. Admission requires departmental approval. May be repeated once for credit. (Fall and spring)

191 **Anthropology, Drama, and the Human Experience** (3) Garner, Allen
A comparative approach to the meaning of humanity in different cultural traditions. Examination of the role of drama in daily life in its secular and ritual forms and contexts in which it is developed for conscious goals. Through improvisation workshops, students explore how the techniques of anthropology and drama can lead to a better understanding of the significance of specific actions and events and of human experience. Offered jointly with the Anthropology Department.

193 **Scene Design** (3) Sabelli
Fundamental study of scenography, including drafting, rendering, stage properties, and model construction. (Fall)

195 **Costume History and Construction** (3) Pucilowsky
History of fashion in Western civilization from ancient Egypt to the present. Fundamental study of costume design, including drawing and rendering techniques through specific projects. Laboratory work in costume construction. (Fall)

196 **Independent Study** (1 to 6) Staff
Independent research and special projects. Open only to undergraduate students in their senior year. Before students are permitted to register for CmTr 196, they must submit a written proposal of the plan of study and obtain approval of the staff member who will be directing the study and of the department chairman.

199 **Senior Seminar: Radio and Television** (3) Staff
Capstone course providing a survey and integration of the major viewpoints and concepts of radio and television. Reading, research, and class discussions on selected topics. Under the guidance of an instructor, the student writes a major research paper on an approved topic. Limited to radio–television majors. Prerequisite: all radio–television required courses or permission of instructor and the major advisor. (First offered fall 1986)

Third Group

205 **Costume Design** (3) Pucilowsky
Introduction to the basic techniques of costume design through specific projects. Various rendering techniques will be explored, consistent with the different historical periods. Prerequisite: CmTr 195. (Spring, odd years)

213 **Special Problems in Speech for the Actor** (3) Jacobson
An advanced study of vocal production and interpretation for the actor. The work will focus on stage dialects and the articulation and interpretation of Shakespeare's plays. Prerequisite: CmTr 113.

215–16 **Acting: Scene Study** (3–3) Jacobson
Scene work in modern, classic, and other nonrealistic drama. Admission by audition. Both courses may be repeated once for credit. Recording fee, $4. (Academic year)

250 **Advanced Scene Design** (3) Sabelli
Preparation for the advanced student designer, with emphasis on the individual development of rendering techniques, technical drafting, traditional script analysis, and original scenographic interpretations. (Fall)

251 **Special Projects in Scene Design** (3) Sabelli
Exploration of all styles of traditional and contemporary scenography. Admission by permission of instructor. (Spring)

252 **Advanced Costuming** (3) Pucilowsky
Study of special design, style, and construction problems. (Spring)

253 **Pattern Making** (3) Pucilowsky
The study of pattern drafting and draping methods, based on historical costumes, through lecture and class work. Basic millinery construction and design. Prerequisite: CmTr 195. (Spring, even years)

255 **Lighting Design** (3) Balling
Theory and execution of lighting design for theater and television. Prerequisite: CmTr 152. (Spring, odd years)

256 **Directing Seminar** (3) Garner
Problems in directing plays from selected periods. May be repeated for credit.

257 **Trends in Professional Theatre** (3) Staff
Study of recent developments in professional theatre production. (Fall, even years)

258 **Theatre Management** (3) Staff
Theory and practice in theatre management: promotion, box office, and house management. Admission by permission of instructor.

261–62 **Theatrical Styles** (3–3) Pucilowsky
Detailed study of the culture, climate, and production techniques of significant periods of drama. Prerequisite: CmTr 165–66. (Academic year)

294 **Independent Research in Theater** (arr.) Staff
May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

COMPUTER AND INFORMATION SYSTEMS

See **Statistics/Computer and Information Systems**.

CRIME IN COMMERCE

See **Forensic Sciences**.

CRIMINAL JUSTICE

See **Forensic Sciences** and **Sociology**.

DANCE

See **Human Kinetics and Leisure Studies.**

DRAMA

See **Communication and Theatre.**

EARLY MODERN EUROPEAN STUDIES

Committee on Early Modern European Studies
R.E. Kennedy (*Chairman*), I. Azar, C.A. Linden, J.A. Quitslund, J.P. Reesing, Jr., L.F. Robinson, R.H. Schlagel, K. Thoenelt, D. Wallace

The Columbian College of Arts and Sciences offers an interdisciplinary program in Early Modern European Studies. This humanities program is designed to enhance the student's understanding of the history, philosophy, religion, science, literature, and art of the five centuries (1300–1800) during which the Western world began to take on its modern dimensions. The program is directed by an interdepartmental committee.

Bachelor of Arts with a major in Early Modern European Studies—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Requirements for the major:
   a. The core interdisciplinary course Individualism, Reason, and Tradition in Early Modern Europe (Hist/Engl/Fren/Ger/Rel 183, and Art 187).
   b. Six semester hours of second-group French, German, or Spanish literature courses taught in the language, from among the following: Fren 120, 121–22, 123–24; Ger 103–4, 111–12, 131–32; Span 121–22, 123–24, 125.
   c. Phil 112; Rel 145; PSc 106.
   d. Twenty-seven semester hours of art history, history, and English literature, with the course distribution to be determined in consultation with the program advisor, and with a minimum of 6 hours from each of the following groups: Art 104–5, 106–7, 108, 113–14, 121–22; Engl 125–26, 127–28, 129, 130, 131–32; Hist 101, 105, 121–22, 123, 141, 148, 151, 153, 154.

EAST ASIAN LANGUAGES AND LITERATURES

Professor C.W. Shih (*Chairman*)
Associate Professors J. Chaves, D.L. Lee
Associate Professorial Lecturer M.-J.C. Loh
Assistant Professors G.C.Y. Wang, Y.-K. Kim-Renaud
Lecturers T. Kimura, L.Y.C. Jiordano

Bachelor of Arts with a major in Chinese language and literature (departmental) in the School of Public and International Affairs and Columbian College of Arts and Sciences—The requirements are as follows:

1. The general requirements stated under Columbian College of Arts and Sciences and the School of Public and International Affairs. (Sixty semester hours from Columbian College, or the equivalent from another accredited institution, are required.)
2. Prerequisite courses—Chin 5–6 (preferred); or Chin 1–2, 3–4, and 9; or Chin 7–8 and 9.
3. Required for the major—Chin 11–12, 109–10, and 163–64 or 181–82; plus 12 additional semester hours of second-group Chinese literature courses. The student is required to pass a major examination at the end of the senior year. The coordinated field of knowledge upon which the student will be examined includes an active command of modern Chinese language and a general knowledge of Chinese literature and culture. A proseminar (Chin 199–200) assists the student in preparation for the major examination.

Bachelor of Arts with a major in East Asian studies (China or Japan)—See Columbian College of Arts and Sciences and the School of Public and International Affairs.

A Junior Year Abroad Program is available.

Master of Arts in East Asian Studies with a concentration in Chinese language and literature. The requirements are as follows:

1. The general requirements stated under the School of Public and International Affairs.
2. Prerequisite: 24 semester hours of Chinese language.
3. 12 semester hours of Chinese literature, 6 hours of history, and 6 hours of relevant East Asian courses.
4. 6 semester hours of thesis research.

CHINESE

First Group

*1–2 **Beginning Mandarin Chinese, Level I** (3–3) Wang
Classroom (3 hours), laboratory (1 hour). Fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 2: Chin 1. Laboratory fee, $30 per semester. (Academic year)

*3–4 **Beginning Mandarin Chinese, Level II** (3–3) Wang
Classroom (3 hours), laboratory (1 hour). Continuation of grammar and spoken Chinese with more emphasis on the written language and reading. Prerequisite to Chin 3: Chin 2 or equivalent. Prerequisite to Chin 4: Chin 3. Laboratory fee, $30 per semester. (Academic year)

5–6 **Beginning Intensive Mandarin Chinese, Levels I–II** (8–8) Lee
Intensive beginner's course in fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 6: Chin 5. Laboratory fee, $30 per semester. (Academic year)

*7–8 **Beginning Intensive Mandarin Chinese** (6–6) Lee, Wang
Intensive beginner's course in fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 8: Chin 7. Laboratory fee, $30 per session. (Summer)

*9 **Beginning Mandarin Chinese, Level II** (4) Lee
Reading of simple modern expository writings. Analysis of syntactic structure and practice in writing. Prerequisite: Chin 4 or 8. Laboratory fee, $30. (Fall or spring)

10 **Chinese Calligraphy** (1) Loh
Design and writing of Chinese characters with traditional writing implements. No knowledge of the language required. May be repeated for credit. (Fall and spring)

11–12 **Intermediate Intensive Mandarin Chinese** (6–6) Wang
Reading of basic texts, writing of short pieces, conversation, systematic review of grammar. Prerequisite to Chin 11: Chin 6 or 9. Prerequisite to Chin 12: Chin 11. Laboratory fee, $30 per semester. (Academic year)

13–14 **Reading Chinese for Beginners** (4–4) Staff
Basic grammar and syntax of modern Chinese; development of reading ability in beginners' textbooks and newspapers. Primarily for graduate students who wish to acquire a reading knowledge without learning to speak or write the language. (Academic year)

22 **Intermediate Chinese Conversation** (2)
A practical course for improving speaking ability. Prerequisite: 6 credit hours of Chinese or equivalent. May be repeated for credit.

91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course offered by the Departments of East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Political Science, and Religion. A comprehensive and integrated introduction to the civilization and present problems of East Asia. (Spring)

* The combination of Chin 1–2, 3–4, and 9, or the combination of Chin 7–8 and 9, is equivalent to Chin 5–6.

Second Group

107–8 **Readings in Modern Chinese** (3–3) Staff
Intensive readings in selected modern literary works, social science materials, and documentary materials. Prerequisite: Chin 12 or equivalent. (Academic year)

109–10 **Introduction to Classical Chinese** (3–3) Shih
Introduction to classical writings in Chinese literature, history, and philosophy. Prerequisite: Chin 6 or 9. (Alternate academic years)

123–24 **Introduction to Chinese Linguistics** (3–3) Lee
Introduction to the history of the Chinese language. Analysis of linguistic structure of modern spoken Chinese and classical Chinese. Prerequisite: Chin 6 or equivalent, or a course in linguistics. (Alternate academic years)

161–62 **Chinese Culture Through Films** (3–3) Shih
Survey of the Chinese cultural heritage presented through films. Topics include literature, philosophy, art, religion, and social history from prehistorical times to the modern era. Lectures and discussion in English.

163–64 **Chinese Literature in Translation** (3–3) Chaves
An introductory course focusing on major works of poetry, drama, and the novel in their historical and social context. (Academic year)

179–80 **20th-Century Chinese Literature** (3–3) Shih
Works of Lu Xun, Lao She, and others. Drama of Tian Han and Cao Yu. Prerequisite: Chin 107 or equivalent. (Alternate academic years)

181 **Literature in Traditional Chinese Society—in Translation** (3) Chaves
Introduction to the various roles played by literature in pre-modern China, as well as the reflection of society in traditional literature.

182 **Literature in the People's Republic of China—in Translation** (3) Chaves
Survey of stories, poems, and plays in the PRC and their role in political and social events.

185–86 **Directed Reading** (3–3) Staff
Reading of material in the student's field of interest. Admission by permission of instructor. (Academic year)

199–200 **Proseminar: Readings for the Major in Chinese Language and Literature** (3–3) Staff
Conferences and group discussions. (Academic year)

Third Group

271–72 **Poetry of the Tang and Song Periods** (3–3) Chaves
Reading of works of leading poets. Discussion of content and style. Prerequisite: Chin 109 or equivalent. (Alternate academic years)

273 **Yuan Drama** (3) Shih
Readings of plays by Guan Han-qing, Ma Zhi-yuan, and others. Prerequisite: Chin 109 or equivalent.

277–78 **Prose Narratives of the Song, Ming, and Qing Periods** (3–3) Shih
Short stories of the Song period. Selected readings of Ming Qing novels. Historical development and stylistic traits. Prerequisite: Chin 107 or equivalent. (Alternate academic years)

299–300 **Thesis Research** (3–3)

JAPANESE

First Group

1–2 **Beginning Japanese, Level I** (4–4) Kimura
Lecture (4 hours), laboratory (1 hour). Fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Japn 3: Japn 1. Laboratory fee, $30 per semester. (Academic year)

3–4 **Beginning Japanese, Level II** (4–4) Kimura
Lecture (4 hours), laboratory (1 hour). Continuation of grammar with more

emphasis on written language and reading. Prerequisite to Japn 3: Japn 2. Prerequisite to Japn 4: Japn 3. Laboratory fee, $30 per semester. (Academic year)

5–6 **Intermediate Japanese** (3–3) Kimura
Reading of basic texts, writing of short pieces, conversation, systematic review of grammar. Prerequisite to Japn 5: Japn 4 or equivalent. Prerequisite to Japn 6: Japn 5 or equivalent. Laboratory fee, $30 per semester. (Academic year)

Second Group

111–12 **Japanese Literature in Translation** (3–3) Chaves
An introductory survey of traditional and modern Japanese literature read in English translation: love and nature poetry; theater (classical drama, puppet plays); fiction; diaries. Particular emphasis is placed on the great women writers of Japan. (Academic year)

162 **Japanese Culture Through Films** (3) Shih
Survey of the Japanese cultural heritage presented through films. Topics include literature, philosophy, art, religion, and social history from prehistorical times to the modern era. Lectures and discussion in English. (Spring)

KOREAN

First Group

1–2 **Beginning Korean, Level I** (4–4) Kim-Renaud
Lecture (4 hours), laboratory (1 hour). Fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Kor 2: Kor 1. Laboratory fee, $30 per semester. (Academic year)

3–4 **Beginning Korean, Level II** (4–4) Kim-Renaud
Lecture (4 hours), laboratory (1 hour). Continuation of grammar with more emphasis on written language and reading. Prerequisite to Kor 3: Kor 2. Prerequisite to Kor 4: Kor 3. Laboratory fee, $30 per semester. (Academic year)

5–6 **Intermediate Korean** (3–3) Kim-Renaud
Reading of basic texts, writing of short pieces, conversation, systematic review of grammar. Prerequisite to Kor 5: Kor 4 or equivalent. Prerequisite to Kor 6: Kor 5 or equivalent. Laboratory fee, $30 per semester. (Academic year)

ECONOMICS

Professors J.W. Kendrick, C.T. Stewart, Jr., J. Aschheim, R.P. Sharkey, H. Solomon, S. Levitan, C.Y. Hsieh, J.L. Gastwirth, M.A. Holman, R.M. Dunn, Jr., W.F.E. Long, S.E. Haber, A. Adams *(Research)*, R.S. Goldfarb *(Chairman)*, J.R. Barth, A.E. Burns *(Emeritus)*, O. Havrylyshyn
Adjunct Professors T.F. Carroll, P. Swamy, J. Hardt, V. Tanzi
Professorial Lecturers R.E. French, E.H. Solomon, K.S. Flamm
Associate Professors R.Y. Yin, A.M. Yezer, J.J. Cordes, J. Pelzman, B.L. Boulier, J.E. Kwoka, R.P. Trost, H.S. Watson
Adjunct Associate Professor M.A. Baily
Assistant Professors V. Fon, W.A. Anderson, J.P. Link, M.D. Bradley, S.C. Smith, M.B. Loewy, M.-H. Ye, A.M. Ishaq *(Visiting)*
Assistant Professorial Lecturers E.C. Suss, M.J. Frederiksen, S.N. Kirby

Bachelor of Arts with a major in economics (departmental)—The following requirements must be fulfilled:

1. The **general requirements stated under Columbian College of Arts and Sciences.** (Students should consult the departmental advisor regarding courses to be taken in

satisfying the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)

2. Prerequisite course—Econ 1–2.

3. Required courses in related areas—Math 41 and 42, or equivalent; Stat 111 and 112, or equivalent; 6 semester hours of a social science other than economics.

4. Required courses in the major—Econ 101, 102, 121, 198, and 15 additional semester hours of second-group economics courses to be approved by the departmental advisor.

Minor in economics.—(a) 18 credit hours in economics, including Econ 1, 2, 101, 102, 121, and one other 100-level course in economics. (b) 6 credit hours of an approved statistics sequence, such as Stat 111–12, or 6 hours selected from Math 31, 32, 41–42, 51–52, or 3 hours of an approved statistics course plus 3 hours selected from Math 31, 32, 41–42, 51–52.

Master of Arts in the field of economics.—Prerequisite: (1) a Bachelor of Arts degree with a major in economics or with substantial course work in economics; (2) an understanding of basic calculus, equivalent to Math 31–32 or 41–42; (3) Graduate Record Examinations for all applicants except foreign nationals.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) Econ 203–4, 205, and 275 or 279; (2) 12 additional semester hours to be selected from other third-group economics courses; (3) a Master's Comprehensive Examination in economic theory; (4) completion of a tool requirement (either the passing of a reading knowledge examination in one foreign language or the satisfactory completion of one of the following courses: Math 124, Stat 157 or 197); and (5) either a thesis (Econ 299–300) or 12 semester hours selected from additional third-group economics courses.

Doctor of Philosophy in the field of economics.—Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) Econ 202, 203–4, 205–6, 215–16, and 27 additional semester hours of approved graduate course work including Econ 275 or 279; (2) passing of the General Examination in microeconomic theory, macroeconomic theory, and two other fields selected by the student and approved by the doctoral program committee; (3) completion of the tool requirement: the passing of a reading knowledge examination in one foreign language, plus the satisfactory completion of the following: Math 124, Stat 118, 157, 181, 183, 197 (a minimum of 6 semester hours in approved graduate course work, completed with a grade of *B* or above, in a department other than Economics, is permitted as a substitution for the language reading examination), and (4) a dissertation to demonstrate the candidate's ability to do original research in one of the following fields: econometrics, development, economic history, economic policy, economic theory, environmental economics, health economics, history of economic thought, industrial organization, international economics, labor economics, mathematical economics, monetary economics, national income accounting, natural resources economics, public finance, regional and urban economics, and Soviet economics.

Examinations: the field examinations that constitute the General Examination are given at least two times per year. Microeconomic and macroeconomic theory examinations should be taken first. They must be passed within six months of completing (a) 36 graduate credit hours toward the degree and (b) two years in the program, the time limit beginning when both (a) and (b) have been accomplished. To pass the General Examination, students must earn a grade of "satisfactory pass" or better in the field examinations in microeconomic or macroeconomic theory and in one of the other two field examinations and no grade below "bare pass." Field examinations may be taken a second time with the approval of the department and the dean. No further opportunity to take the examinations is permitted. Students should consult with the professors responsible for their fields and notify the department *two months in advance* of their intention to take the examinations. If such notification is not given sufficiently in advance, it may not be possible to sit for the examination. These examination requirements apply in full to all students who entered the economics Ph.D. program in the 1979 fall semester and thereafter.

Conclusion of the first unit of study includes satisfactory completion of course work, tool requirements, and passing the General Examination as described above. The first unit must be concluded within five years after entry into the program. Admission to the second unit, or dissertation stage, will then be considered for students who have concluded the first stage. Students admitted to the second unit will be recommended by the Department of Economics for the Master of Philosophy degree.

Departmental prerequisite: Econ 1–2 is prerequisite to all other courses in economics except Econ 217–18.

First Group

1–2 **Principles of Economics** (3–3) Hsieh, Dunn
Lecture (2 hours), discussion (1 hour). Survey of the major economic principles, institutions, and problems in contemporary life. Econ 1: macroeconomics; Econ 2: microeconomics. (Econ 1 and 2—fall and spring)

91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course offered by the Departments of East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Political Science, and Religion. A comprehensive and integrated introduction to the civilization and present problems of East Asia. (Spring)

Second Group

101 **Intermediate Microeconomic Theory** (3) Yezer, Fon
Price theory, including consumer demand, theory of the firm, production, and exchange. (Fall and spring)

102 **Intermediate Macroeconomic Theory** (3) Yin, Bradley, Loewy
Theories of national income determination and growth. (Fall and spring)

104 **History of Economic Thought** (3) Hsieh
History of the major schools of economic thought, influence of changing problems on the development of economic theory. Prerequisite: Econ 101, 102.

105 **Economic Conditions Analysis and Forecasting** (3) Kendrick
Theory and empirical analyses of economic trends and fluctuations; use of economic indicators and simple econometric models. (Fall)

121 **Money and Banking** (3) Barth, Loewy
The role of money, credit, interest rates, foreign exchange rates, and commercial banks and other financial institutions in the U.S. economy. (Fall and spring)

122 **Monetary Theory and Policy** (3) Aschheim, Loewy
Analysis of role of money in economic activity in terms of supply of and demand for loanable funds, interest rates, and price level. Problems of U.S. monetary policy. Prerequisite: Econ 121. (Spring)

123 **Introduction to Econometrics** (3) Trost
Joint offering of the Economics and Statistics Departments. Construction and testing of economic models: regression theory, parameter estimation, and statistical techniques applicable to economic models. Prerequisite: Econ 101, 102; Math 31 or 41; Stat 112. (Spring)

130 **Comparative Economic Systems** (3) Aschheim
Critical exposition of fundamental economic concepts and theories of capitalism, communism, socialism, and fascism.

133 **Economy of the Soviet Union** (3) Pelzman, Hardt
Analysis and review of the economic development and performance of the Soviet Union from the pre-revolutionary period to the present. (Fall)

134 **Comparative Communist Economic Systems** (3) Pelzman, Hardt
Analysis and review of the economic development and performance of the East European economies in the post-World War II period. Soviet-type and alternative planning models. Prerequisite: Econ 133. (Spring)

136 **Natural Resources and Environmental Economics** (3) Yezer
Analysis of market mechanisms that allocate energy and natural and environ-

mental resources; investigation of actual and optimal resource allocation across uses and time; review of arguments for public intervention. (Spring)

141 **Women in the Labor Market** (3) Haber
Application of the theory of the household and investment in human capital to female labor force participation, marriage, and family formation; analysis of sex discrimination. (Spring)

142 **Labor Economics** (3) Haber
Analysis of labor supply and demand; measurement and theory of unemployment; occupational choice; wage differentials; labor market issues and policies. (Fall)

147 **Economic History of Europe** (3) Sharkey
Joint offering of the Economics and History Departments. European economic development since the Middle Ages; emphasis on the period following the Industrial Revolution. Evolution of capitalism and its impact upon the societies of Europe. (Spring)

148 **Health Economics** (3) Baily
Analysis of the determination of prices, output, and productivity in the health services sector of the economy. (Fall)

151 **Economic Development** (3) Havrylyshyn, Smith
Economic problems of underdeveloped nations, with emphasis on economic theories of development and empirical measurement of development problems.

153 **Income Distribution** (3) Haber, Goldfarb
An analysis of the distribution of income, with focus on policy issues relating to wealth and poverty. (Spring)

157 **Urban and Regional Economics** (3) Yezer
Analysis of the determinants of urban growth and development; firm location; the functioning of urban land and housing markets.

158 **Industrial Organization** (3) Kwoka
Analysis of market structure, conduct, and performance of firms in a market economy, with emphasis on case studies of U.S. industries. (Fall)

159 **Government Regulation of the Economy** (3) Kwoka
Economic analysis of antitrust and regulation in the American economy. Prerequisite: Econ 158 or 101. (Spring)

161 **Public Finance I** (3) Cordes, Watson
Theoretical and institutional analysis of government expenditures and intergovernmental fiscal relations. (Fall)

162 **Public Finance II** (3) Cordes, Watson
Theoretical and institutional analysis of tax policy and debt management. (Spring)

165 **Economics of Human Resources** (3) Stewart
Economic analysis of education and training, research and innovation, and related contemporary problems. (Fall)

169 **Introduction to the Economy of the People's Republic of China** (3) Yin
Background, organization, and operation of the economy. Appraisal of performance and analysis of problems of development. (Fall)

170 **Introduction to the Economy of Japan** (3) Staff
Analysis of the structure and growth of the Japanese economy. (Spring)

179–80 **U.S. Economic History** (3–3) Sharkey
Joint offering of the Economics and History Departments. Process of economic growth from Colonial times to the present. Development of various sectors in the economy and their interdependence. Econ 179: 1607–1865. Econ 180: 1865 to present. (Academic year)

181–82 **International Economics** (3–3) Dunn, Pelzman, Anderson
Econ 181: International trade theory and international monetary theory. Econ 182: Continuation of international monetary theory; economic development. (Academic year)

185 **Economic History and Problems of Latin America** (3) Staff
Analysis of present structures and problems of Latin American economies. (Spring)

198 **Proseminar in Economics** (3) Aschheim, Cordes, Stewart
Research on major topics in economic theory, including the application of theory and analysis to policy problems. Open only to economics majors in their senior year. (Fall and spring)

199 **Independent Research in Economics** (3) Staff
Under the personal direction of an instructor. Limited to economics majors with demonstrated capability. Prior approval of instructor required. (Fall and spring)

Third Group

Third-group economics courses (except 217–18 and 243) are designed for graduate students in economics or for other graduate students having had Econ 217–18 or 101 and 102, plus any prerequisites specific to the particular course.

202 **History of Economic Thought** (3) Hsieh
Critical analysis and interpretation of the development of economic theory from Plato through the formulation of the Neoclassical Synthesis paradigm and contemporary revisions of the Neoclassical Synthesis. (Fall and spring)

203–4 **Microeconomic Theory** (3–3) Goldfarb, Fon, Ye
Econ 203: Demand, production, cost theory. Prerequisite: Econ 101 or equivalent. Econ 204: Market structure, welfare, general equilibrium. Prerequisite: Econ 203. (Econ 203 and 204—fall and spring)

205 **Macroeconomic Theory I** (3) Barth, Bradley
Alternative theories of income, employment, and the price level; fiscal and monetary policy impacts; the role of expectations in the economy. (Fall and spring)

206 **Macroeconomic Theory II** (3) Barth, Bradley
Continuation of Econ 205. Extensions of alternative models of income determination; application of analytic frameworks to the U.S. economy; examination of uncertainty and policy strategy. (Fall and spring)

207 **Business Cycle Analysis** (3) Kendrick
Review of cycle theory; empirical analyses of U.S. economic fluctuations; forecasting methods; policy issues. (Fall)

208 **National Income** (3) Kendrick
Theory and measurement of economic aggregates within an integrated accounting framework; uses of accounts for macroeconomic analysis and projections. (Fall)

209 **Capital and Growth Theory** (3) Hsieh
Growth models under both the paradigm of the Neoclassical Synthesis and that of Post-Keynesian economics. Other selected topics in Post-Keynesian economics and recent attempts to attain a new synthesis in economic theory. Prerequisite: Econ 205.

211 **Analytic Methods for Management and Policy I** (3) Staff
Primarily for graduate students in fields other than economics. Various quantitative techniques, such as simulation, cost–benefit analysis, mathematical programming, and difference equations, and their roles in policy analysis are presented in a theoretical context and viewed in terms of their utility in the management policy context. Same as OR 235. Prerequisite: Stat 51 and Econ 217 or equivalent. (Fall)

212 **Analytic Methods for Management and Policy II** (3) Staff
Primarily for graduate students in fields other than economics. A more advanced treatment of the quantitative techniques introduced in Econ 211, including cost–benefit analysis and mathematical programming techniques. Additional topics include applications of game theory, econometric model-

ing, and simulation models to policy analysis. Prerequisite: Econ 211 or OR 235. (Spring)

214 **Survey of Mathematical Economics** (3) Fon
For graduate students in fields other than economics. Differentiation, partial differentiation, and economic optimization problems. Comparative statics. Input–output analysis. Difference, differential equations, and economic applications. Prerequisite: one semester of calculus and Econ 217–18.

215–16 **Mathematical Economics** (3–3) Fon
Formulation and application of mathematical models in economic theory. Prerequisite: a one-year calculus sequence. Open to undergraduates. (Academic year)

217–18 **Survey of Economics** (3–3) Holman
Intermediate-level microeconomic theory (Econ 217) and intermediate-level macroeconomic theory (Econ 218) for graduate students in fields other than economics. Departmental prerequisite waived. (Econ 217 and 218—fall and spring)

221–22 **Applied Economics** (3–3) Adams
Primarily for students in fields other than economics. An extension of microeconomic welfare analysis to questions related to public and industrial concerns, including cost–benefit analysis, taxation, domestic regulation, urban issues, and the international arena. Some analysis of macroeconomic policy questions is examined in Econ 222. (Academic year)

223–24 **Monetary Theory and Policy** (3–3) Aschheim, Barth
Theory of monetary policy within the framework of contemporary American central banking. (Academic year)

233 **Rural Development Policies** (3) Carroll
Review of poverty-oriented rural development strategies in the LDCs. Theories and experiences of land reform, peasant cooperatives, small-farm technology, rural–urban linkages, and planning a rural service network. (Fall)

234 **Rural Development Projects** (3) Carroll
Design and evaluation of rural-based investment projects, including multisector approaches to integrated planning of rural regions, with case studies drawn from the experience of international agencies. Prerequisite: Econ 233 or permission of instructor. (Spring)

235 **Energy Resources and Policy** (3) Staff
Consideration of economic and related policy issues directed at energy problems. (Fall)

236 **Middle East Economics** (3) Staff
Survey of Middle East economics emphasizing the application of economic tools to selected issues of importance.

237 **Economics of the Environment and Natural Resources** (3) Holman
Analysis of public policy problems relating to the environment and natural resources development and management. (Spring)

239 **Economics of Defense** (3) H. Solomon
Economic analysis applied to national security planning and objectives. Analysis of defense establishment problems, including manpower, the defense industry base, procurement policy. (Spring)

241–42 **Labor Economics** (3–3) Goldfarb
Theory of wages and employment, analysis of labor supply and demand. Analysis of unemployment; unions; labor market discrimination. Econ 241 is prerequisite to Econ 242. (Academic year)

243 **Seminar: Human Resource Policy** (3) Levitan
The shifting composition of the American work force and its measurements: linking of work and welfare; preparation for work; evaluation of public investment in human resource development. Open to undergraduates. (Fall)

244 **Economics of Education** (3) Staff
Returns to investment in education, allocation of resources to and within education, educational financing.

245–46 **Industrial Organization** (3–3) Kwoka
Econ 245: Economic theory and evidence regarding industrial market structure, conduct, and economic performance. Econ 246: Economic issues in antitrust and government regulation of the U.S. economy. Econ 245 is prerequisite to Econ 246. (Academic year)

247 **Seminar: Industrial Organization** (3) Staff
Selected topics in regulatory and antitrust economics. Prerequisite: Econ 101 or equivalent. Offered off campus only. (Spring)

248 **Health Economics** (3) Baily
Demand for medical care; organization of the health care delivery industry; policy issues on regulation, efficiency, and allocation of health care services. (Spring)

249 **Seminar: Industrial Organization—The Telecommunications Industry** (3)
Structure, interrelationship, and function of the telecommunications industry within a changing regulatory framework. Offered off-campus only.

251 **Economic Development Theories** (3) Havrylyshyn, Smith
Basic theories of economic growth and development. Emphasis on theories inspired by the development process in Third World countries. (Fall and spring)

252 **Economic Development Planning** (3) Havrylyshyn, Smith
Development planning techniques and practice at both the macro and micro levels. Macro planning tools analyzed include input–output, multisector models, simulation, and linear programming. Micro planning includes the use of cost–benefit techniques in project analysis. Prerequisite: Econ 251. (Spring)

253 **Productivity Analysis** (3) Kendrick
Concepts, measurement, and analysis of productivity in business and government at aggregate and organizational levels. (Fall)

255 **Economics of Technological Change** (3) Staff
Economic principles related to determining the proper federal role in influencing civilian-oriented technological change. (Fall)

257 **Regional Economics** (3) Yezer
Study of regional planning and growth models, including input–output, programming, and econometric models used by planning agencies; analysis of interregional production, trade, migration, firm location, and pricing models. (Fall)

258 **Urban Economics** (3) Yezer
Analysis of spatial relationships among economic activities within an urban area including the urban land, labor, and housing markets; urban transportation models; fiscal relationships among jurisdictions. Prerequisite: Econ 257 or permission of instructor. (Spring)

259 **Income Distribution** (3) Stewart, Carroll
Theoretical and empirical analysis of income distribution, including analysis of policies related to reducing income inequality. (Spring)

261 **Welfare Economics** (3) Stewart
Theories of welfare economics and their applications to public policy; analysis of selected topics in public policy. (Fall)

263 **Theory of Public Finance I** (3) Cordes, Watson
Allocation and distribution aspects of government budget policy, including critical analysis of theories and principles of expenditures, and intergovernmental fiscal relations. (Fall)

264 **Theory of Public Finance II** (3) Cordes, Watson
Analysis of the effects of taxation on resource allocation and income distribution; impact of the public debt. (Spring)

265 **Seminar: Fiscal Policy in Developing Countries** (3) Tanzi
Examination of topics in the public finances of developing countries, including taxation, expenditure, and macroeconomic aspects. (Fall)

267 **Seminar: Soviet Economy** (3) Hardt, Pelzman
An analysis of the Soviet-type economy. Issues discussed include growth strategy, investment and price policy, and foreign trade and aid strategy. Admission by permission of instructor. (Fall)

268 **Seminar: Economic Theory and Development in Communist Countries** (3) Hardt, Pelzman
An analysis of the application of the Stalinist model to Eastern Europe and the resulting reforms. Prerequisite: Econ 267 or permission of instructor. (Spring)

269 **Economy of the People's Republic of China I** (3) Yin
Analysis of organization, operation, policies, and problems. Development of the economy since 1949. (Fall)

270 **Economy of the People's Republic of China II** (3) Yin
Continuation of Econ 269, examining critical problems of development. Prerequisite: Econ 269 or permission of instructor. (Spring)

271 **Economy of Japan** (3) Staff
Analysis of Japanese economic institutions and their contribution to Japan's development. (Fall)

275 **Econometrics I: Introduction** (3) Trost
Single-equation models of economic behavior. Statistical methods for testing economic hypotheses and estimating parameters. Topics include heteroscedasticity, serial correlation, and lagged dependent variables. Prerequisite: Econ 123. Some exposure to matrix algebra is helpful, but not required. (Fall and spring)

276 **Econometrics II: Simultaneous-Equation Models** (3) Trost
Simultaneous-equation models of economic behavior. Optional topics are maximum-likelihood estimation, limited dependent variables, and quantum-response models. Prerequisite: Econ 275. Recommended: a course in matrix algebra. (Spring)

277 **Laboratory in Applied Econometrics** (3) Trost
Application of econometric theory. Use of econometric software. Each student will be required to write an empirical research paper. Prerequisite: Econ 275 or, with the permission of the instructor, Econ 123.

279 **Methods in Economic Statistics** (3) Gastwirth
Joint offering of the Economics and Statistics Departments. Application of statistical methods to economic data. Regression, analysis of variance, and nonparametric techniques are used to analyze economic data. Measures of inequality, economic concentration, and forecast accuracy are discussed. Prerequisite: a one-year course in statistics. (Fall)

281–82 **International Economics** (3–3) Dunn, Pelzman
Econ 281: An analysis of standard models of international trade, commercial policy, factor flows, and regional trade arrangements. Econ 282: International finance, including alternative models of balance of payments behavior and adjustment, payments accounting, exchange markets, and alternative exchange-rate regimes. Prerequisite: course work in intermediate macro- and microeconomic theory.

285–86 **Economic Development of Latin America** (3–3) Staff
Econ 285: Diversity of structures of Latin American economies; relevant theories; import substituting industrialization; inflation; problems of underemployment and income distribution. Econ 286: Structure of trade; protection, exports, and economic development; regional and global economic integration; foreign investment, multinational enterprise, and technology transfer. (Academic year)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Same as Anth/Geog/Hist/Span 287, and PSc 285. Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

290 **Principles of Demography** (3) Boulier
Introduction to basic demographic perspectives and data; methods for analysis of population size, distribution, and composition; determinants and consequences of population trends. Same as Geog/Soc/Stat 290. (Fall)

291 **Methods of Demographic Analysis** (3) Boulier
Basic methods for analysis of mortality, natality, and migration; population estimates and projections; estimation of demographic measures from incomplete data. Same as Geog/Soc/Stat 291. (Spring)

298 **Reading and Research** (3)
Limited to master's degree candidates. (Fall and spring)

299–300 **Thesis Research** (3–3)
(Fall and spring)

Fourth Group

Fourth-group economics courses are limited to graduate students and are primarily for doctoral candidates. They are offered as the demand requires and may be repeated for credit with permission of the instructor.

305 **Seminar: Macroeconomics** (3) Barth, Bradley
Selected topics in macroeconomics. Prerequisite: Econ 205.

310 **Economic Methodology** (3) Staff
Methodology of economics, review of selected theoretical issues in economic theory. Prerequisite: six semester hours of graduate courses in economic theory.

312 **Seminar: Price Theory** (3) Staff
Discussion of topics of price theory from recent journal articles.

313 **Seminar: Economic Thought** (3) Hsieh
Continuation of Econ 202. Principal trends in economic thought.

315 **Seminar: Topics in Mathematical Economics** (3) H. Solomon
Intensive study of selected topics, including economic activity analysis, risk and uncertainty, and other topics of current interest. Prerequisite: Econ 215–16.

321 **Seminar: Monetary Theory** (3) Aschheim, Barth
Recent developments in monetary theory economics.

341 **Seminar: Labor Economics** (3) Staff
Current problems in theory and policy.

345 **Seminar: Industrial Organization** (3) Staff
Review of recent literature and current policy issues. Admission by permission of instructor

348 **Topics in Health Economics** (3) Staff
An in-depth treatment of advanced topics in health economics. Prerequisite: Econ 248 or permission of instructor

351 **Seminar: Economic Development** (3) Staff
Analysis and review of recent theoretical work in the field, and/or selected topics of current policy interest. Prerequisite: Econ 251 and 252 or permission of instructor

363 **Seminar: Public Finance** (3) Cordes, Watson
Selected topics of current interest

367 **Seminar: Soviet Planning in Theory and Practice** (3) Pelzman
An analysis and review of recent work on planning theory as applied to the Soviet Union. Marxist ideology with modification is taken as the primary force shaping the objective function of Soviet planners. Soviet economic performance is evaluated based on this criterion. Prerequisite: Econ 203–4 and 267 or permission of instructor

378 **Seminar: Topics in Econometrics** (3) Swamy
Research seminar covering current econometric literature and special topics. Admission by permission of instructor. Same as Stat 378.

379–80 **Readings in Economic History** (3–3) Sharkey
Joint offering of the Economics and History Departments. Econ 379: American

economic history. Econ 380: Modern European economic history. Prerequisite: the appropriate second-group preparation and consent of instructor. (Academic year)

390 **Seminar: International Economic Theory** (3) Staff
Limited to graduate students, primarily for doctoral students. Examination of recent contributions in this field.

391 **Seminar: International Economic Policy** (3) Staff
Topics selected from current significant policy problems.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

EDUCATION

Professors M.N. Rashid, L.H. Elliott, L. Nadler, J.G. Boswell *(Chairman)*, C.E. Vontress, S. Kavruck *(Emeritus)*, D.A. Moore, L. Winkler, D. Linkowski, F.J. Brown, E.P. Kulawiec, E.W. Kelly, Jr., S.R. Paratore, R. Ferrante, G.L. Horrworth, E.J. Gleazer, Jr. *(Visiting)*, M.A. Burns, J.C. Heddesheimer, G.W. Smith, J.A. Greenberg, R.I. Peterson, D.E. Hawkins, J.D. Hunt, G.D. Wiggs, J.D. Fife
Adjunct Professor R.C. Rist
Professorial Lecturers D. Iwamoto, A.C. Jensen, D.D. Darland, E.L. Shafer
Associate Professors D.H. Holmes, R.A. Luke, E.R. Lilly, C.H. Hoare
Associate Professorial Lecturers S.S. Beck, D.L. Edgell, C. Gerhard
Assistant Professor P. Finnerty-Fried
Assistant Professorial Lecturers M.R. Phelps, P. Callas, E. Zuniga, S.J. Knight
Instructors C.B. Stapp, T.J. Martin

See the School of Education and Human Development for programs of study leading to the degrees of *Bachelor of Arts in Education and Human Development*, *Master of Arts in Education and Human Development*, *Master of Arts in Teaching*, *Education Specialist* and *Doctor of Education*. See Travel and Tourism for courses in that field, which is administered by the Department of Education.

First Group

9 **Techniques for Acquiring Meaning from College Texts** (0)
The course is divided into three modules, which may be taken in sequence or individually. Each module addresses the acquisition, retention, and utilization of meaning as presented in college text materials. Analysis and synthesis of information into verbal and written discourse are emphasized. Each student receives an evaluation of his or her college-level reading ability. Placement testing is required, for which a $10 fee is charged. Tuition is charged at the rate of 1 credit hour for each module.

50 **Introduction to Education and Human Services** (3) Boswell and Staff
The scope of education and human services is defined from historical, philosophical, and cross-cultural perspectives. Field trips and guest speakers. Field work is required. (Fall and spring)

71 **Introduction to Human Development I** (3) Staff
Lectures and field work. All aspects of development through adolescence; child study techniques. Two to three hours weekly field experience in appropriate setting. (Fall and spring)

72 **Introduction to Human Development II** (3) Hoare
Adult development from young adulthood to old age. Dominant psychological, social, and physical competencies; motivational changes; coping styles; maladaptive behavior. Three hours weekly field experience in appropriate agency setting. (Fall and spring)

75 **Introduction to Rehabilitation** (3) Finnerty-Fried
Overview of rehabilitation profession, including philosophy, history, ethics, legislation, settings, and practice. (Fall)

87–88 **Sign Language and Deafness** (3–3) Staff
Basic expressive and receptive skills in sign language of the deaf. Discussion of issues and implications of deafness. Same as HKLS/SpEd 87–88.

100 **Special Workshop in Education and Human Development** (arr.) Staff
Topics to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

Second Group

Educ 136, 137, 138, 139, 140, 144, and 146 are special methods courses that are to be elected in the senior year by students in the secondary school curriculum after substantial preparation in the teaching fields concerned. Course requirements and hours of credit vary with license requirements. Prerequisite to all special methods courses: Educ 104, 105 for elementary majors; Educ 131 for secondary majors.

104 **Psychology for Learning and Teaching** (3) Staff
Principles, theory, nature, and course of learning and teaching processes. Examination and analysis of the strategies and dynamics of teaching and learning in behavioral settings. Three-hour field work sessions. (Fall and spring)

105 **Social Issues in Education and Human Services** (3) Boswell and Staff
Historical and social development of education and human services, contemporary issues, interrelationship of educational and human service institutions, policy considerations, and future issues. Field work is required. Prerequisite: Educ 50 or permission of instructor. (Fall and spring)

110 **Elementary School Teaching of Reading** (3) Horrworth
Introduction to methods, techniques, materials, and activities essential to a good elementary school reading program. Prerequisite: Educ 104 and 105 or teaching experience

111 **Elementary School Curriculum and Methods** (3 to 18) Moore and Staff
A comprehensive block course that includes diagnostic reading, mainstreaming, mathematics, science, language arts, social studies, music, art, physical education. Pre-student teaching one and one-half days a week. Prerequisite: Educ 71, 72, 104, 105; and senior standing. (Fall)

112 **Measurement and Evaluation** (3) Staff
Basic evaluative measurement techniques: selection, administration, and interpretation of standardized tests; test construction, evaluation procedures, statistical analysis. (Fall and spring)

113 **Elementary School Art** (3) Staff
Lecture and laboratory (3 hours), field work (as arranged). For undergraduates in the elementary school curriculum. Materials and methods. Material fee, $5. (Spring)

118 **Elementary Reading: Classroom Diagnosis and Instruction** (3) Horrworth
Emphasis on diagnostic procedures aimed at individualizing and improving classroom instruction. Prerequisite: Educ 110 or equivalent. (Fall and spring)

120 **Experimental Course in Education and Human Development** (arr.) Staff
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs

121 **International Experiences** (1 to 6) Staff
Travel to a foreign country for study of a specific topic.

124 **Communication Skills** (3) Staff
Theory and practice in the development of communication skills in the museum. Educational concepts; teaching strategies and techniques; institutional liaison and group process. Admission by permission of the instructor.

125 **Museums as Cultural and Educational Resources** (3) Staff
Use of the museum for knowledge and enjoyment; museum objects as primary sources; meetings in D.C. area art, history, and science museums

128 **Children's Literature** (3) Staff
Lectures, discussion, and field work. Classics as well as newer books for children and youth are explored. Significant authors and illustrators are highlighted. (Spring)

129 **Critical Social Issues in Literature for Children and Youth** (3) Staff
Content evaluation of books, including issues such as ethnicity, sexism, family problems, handicapping conditions, death, and the role of fantasy versus realism. (Summer)

131 **Secondary School Principles and Methods** (3) Kulawiec
For seniors. Classroom management and teaching techniques for initiating, guiding, and evaluating learning activities. Group work to be arranged. Prerequisite: Educ 104 and 105. (Fall)

132 **Student Teaching in Early Childhood Schools** (3 or 6) Staff
For seniors. Supervised teaching in selected prekindergarten or kindergarten class in accredited school; seminar. Admission by permission of instructor. Prerequisite: Educ 111 or equivalent; Educ 150, 152, 153, 154. (Fall and spring)

133 **Supervised Experience in Education and Human Development Services** (3 to 6) Staff
Field work, internship, and instructional practice: (1) adult education and human resource development (Wiggs); (2) college student development experience (Burns); (3) higher education (Greenberg); (4) museum education (Nashman); (5) counseling (Heddesheimer). Admission by permission of instructor. (Fall and spring)

134 **Student Teaching in Secondary Schools** (6 to 9) Kulawiec and Staff
For seniors. Admission by permission of instructor. Prerequisite: Educ 131. (Fall and spring)

135 **Student Teaching in Elementary Schools** (6 or 12) Moore and Staff
Supervised teaching in the elementary school for one semester. Seminar for seniors. Admission by permission of instructor. Prerequisite: Educ 111 or equivalent. (Fall and spring)

136 **Teaching English in Secondary Schools** (3) Staff
Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours in English. (Spring)

137 **Teaching Speech** (3) Staff
Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours in speech or permission of instructor. (Spring)

138 **Teaching Social Studies in Secondary Schools** (3) Staff
Lecture (2 hours), field work (2 hours). Prerequisite: 24 semester hours of social studies. (Spring)

139 **Teaching Art in Secondary Schools** (3) Staff
Lecture (2 hours), laboratory (2 hours). Prerequisite: 24 semester hours of art. Material fee, $5. (Spring)

140 **Teaching Mathematics in Secondary Schools** (3) Staff
Lecture (2 hours), field work (2 hours). Prerequisite: mathematics through calculus. (Spring)

142 **Teaching Music in Secondary Schools** (3) Staff
Prerequisite: 24 semester hours of music courses.

144 **Teaching Science in Secondary Schools** (3) Kulawiec
Lecture (2 hours), field work (2 hours). Prerequisite: 24 semester hours of science. (Spring)

146 **Teaching Foreign Languages** (3) Kulawiec
Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours of one foreign language. (Spring)

150 **Foundations of Early Childhood Education** (3) Staff
Historical development, philosophy, and objectives of nursery schools, kindergartens, and day care; exploration of contemporary programs and models with curriculum implications for schools in the U.S. and abroad. Admission by permission of instructor. (Fall)

152 **Early Childhood Curriculum** (3) Staff
Rationale, development, content approaches, programs, and materials in language arts, mathematics, science, health, social studies, and aesthetic education. Admission by permission of instructor. (Fall)

153 **Role of the Professional in Early Childhood Education** (3) Staff
Planning, reporting, records, teacher–child and teacher–family interaction, diagnosis and evaluation, working with paraprofessionals and parents. Emphasis on total classroom ecology. Admission by permission of instructor. (Spring)

154 **Community Resources and Materials for the Young Child** (3) Staff
Interaction with community agencies and resources for services; equipment, play activities, curriculum materials, and methods for teaching the infant and young child. Admission by permission of instructor. (Spring)

162 **Foundations of Counseling** (3) Heddesheimer, Winkler
Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues. (Fall and spring)

163 **Personal and Social Adjustment** (3) Winkler
Mental health problems; emphasis on needs of counselors, teachers, and others working with children and adolescents. (Fall and spring)

171–72 **International Education** (3–3) Moore
Survey of selected foreign educational systems and cultures. Research, techniques, and materials to develop world-mindedness. Embassy resources utilized. (Summer)

173 **Comparative Education** (3) Kulawiec
A systematic investigation of the educational structure and practices of selected representative school systems throughout the world. Emphasis on development of a methodology for comparative study. (Fall)

178 **Designing and Implementing Conferences and Meetings** (3) Nadler, Luke
Same as T&T 178. Use of design committees, steering committees, selection of resource people, site selection, exhibits, and relation to supplier personnel. Special attention to designing the core of the conference and related conference activities. (Spring and summer)

180 **Computer Literacy** (3) Staff
Classroom presentations (changing computer utilization, computer terms and practices, academic/administrative computer applications) and sessions in the microcomputer laboratory, including hands-on experience with computer-assisted instruction, introduction to BASIC, and a supervised individual project. No previous computer experience required. May be taken for graduate credit. Material fee, $30. (Fall and spring)

182 **Organization and Administration in the Human Services** (3)
Introduction to organizational theory and program administration in nonschool agencies, staff recruitment and development, fiscal operations, personnel and program supervision, facilities, and maintenance of effective community relations. (Spring)

193–94 **Research and Independent Study** (arr.) Staff
Individual research under guidance of a staff member. (Academic year)

198 **Power, Leadership, and Education** (3) Boswell
The nature of power, leadership, and education; the relationship of power to leadership; the essential nature of education in the exercise of power and leadership in a democratic setting. (Fall)

200 **Special Workshop in Education and Human Development** (arr.)
Topics to be announced in *Schedule of Classes*. May be repeated for credit.

Third Group

Departmental prerequisite: A degree from an accredited institution is prerequisite to all third-group courses in education. Adequate professional preparation is prerequisite to all third-group courses in education except for those courses limited to students in the M.A.T. degree program. Undergraduate students in their senior year may enroll in third-group courses with permission from the instructor.

201–2 **International Education** (3–3) Moore
A study of a selected sample of foreign education systems as they reflect culture, history, values, people, and current changes in the world today. Research techniques and resources to develop a global frame of reference. Foreign resources utilized. (Summer)

203–4 **Comparative Education** (3–3) Kulawiec
A systematic investigation of the educational structure and practices of selected representative school systems throughout the world. Emphasis on development of a methodology for comparative study. (Academic year)

205 **Foundations of Curriculum Development** (3) Staff
For experienced teachers. Curriculum research and design, issues and trends, comparison of curriculum patterns, curriculum development in subject areas, and group consideration of current field-related problems. (Fall)

207 **Instructional Materials, Media, and Resources** (3 to 6) Staff
Review of technological contributions to education. Examination of current and emerging developments. Framework for study of selection, utilization, integration, and evaluation of audiovisual media in the teaching/learning process. (Summer)

208 **Human Development** (3) Rashid
Consideration of human development and behavior throughout the life span; emphasis on practical implications of relevant interdisciplinary research. (Fall and spring)

209 **Child Development** (3) Rashid
Interdisciplinary approach to child development and behavior. Practical implications of research in disciplines contributing to knowledge about childhood. (Fall)

210 **Adolescent Development** (3) Rashid
Interdisciplinary approach to adolescent development and behavior. Practical implications of research in disciplines contributing to knowledge about adolescence. (Spring)

212 **Quantitative Methods I: Introduction to Survey Measurement and Research** (3) Kavruck, Smith, and Staff
Introduction to measurement techniques and evaluation. Emphasis on application and interpretation of data gathering techniques and descriptive statistics.

213–14 **Western Educational Thought** (3–3) Boswell, Darland
Following the themes of certainty, equality, and progress, this course examines the ideas of selected philosophers in their historical context and relates them to education. Educ 213: From Sumer to the Enlightenment: Educ 214: From the Enlightenment to the present with concentration on the American experience. (Fall and spring)

215 **Practicum for the Gifted** (3 or 6) Rashid
A culminating supervised experience in a variety of settings for students in the M.A. program for the gifted. Admission by permission of the instructor.

216 **Advanced Study of the History of Education** (3) Boswell, Darland
Individually planned program of study on topic of student's interest. Prerequisite: Educ 213–14 or the equivalent.

217 **Advanced Study of the Philosophy of Education** (3) Boswell, Darland
Individually planned program of study on topic of student's interest. Prerequisite: Educ 213–14 or the equivalent.

218 **Social Foundations of Education** (3) Kulawiec
The relationship between school and society explored: social, economic, and

political purposes of schooling as well as forces that shape policies and school curricula. Contemporary issues studied with implications for the future.

220 **Experimental Course in Education and Human Development** (arr.) Staff
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

221 **International Experiences** (1 to 6) Staff
Travel to a foreign country for specific study and research. Admission by permission of the instructor.

222 **Foundations of Reading Development: K–Adult** (3) Horrworth
Basic theories and processes of reading acquisition; linguistic, cognitive, developmental, social, and affective bases of reading; varieties and influences of media and instructional strategies.

223 **Reading Instruction in Content Areas: Elementary, Intermediate, and Secondary Schools** (3) Horrworth
Emphasis on basic group instructional methods and media; teaching demonstrations of basic reading and study skills in content subjects; study of readability of content materials; research and application of formulas. (Fall)

224 **Diagnostic Teaching of Reading: K–6** (3) Horrworth
Classroom teaching and testing techniques for elementary teachers; construction of informal tests; administration, scoring, and interpretation of informal tests and other measures of evaluation; selecting and planning activities suitable for correction of specific problems. Prerequisite: at least one previous course in reading. (Spring)

226 **Diagnostic Teaching of Reading in Secondary School** (3) Horrworth
Application of instructional strategies and techniques in Educ 223 and 224; construction of informal tests; administration, scoring, and interpretation of informal and standardized tests; study and evaluation of materials and teaching procedures; application of readability formulas; class demonstrations of teaching strategies. Admission by permission of instructor. (Spring)

227 **Basic Issues in Elementary Education** (3) Staff
Identification, definition, and analysis of some of the most important problems facing the contemporary American elementary school. (Fall)

228 **Instructional Areas in Elementary Education** (3) Staff
Current trends and research in reading, language arts, social studies, mathematics, science, music, art, and physical education. (Spring)

230 **Managing Computer Applications** (3) Ferrante
For managers and prospective managers in education and human services who are concerned with the automation of their operations. Students will acquire the basic principles needed to design, implement, and manage an information system. Prerequisite: permission of instructor. (Spring and summer)

234 **Curriculum Design and Development for Individualized Learning** (3) Horrworth
Practical application of individualized instruction theories and methods through design, development, implementation, and revision of elementary and secondary level self-instructional packages.

235 **Analysis of Teaching** (3) Ferrante, Kulawiec
Teaching as work: diagnosing learning skills, program planning and implementation, feedback on both student and program. (Fall)

236 **Technical Programs in Human Resource Development** (3) Staff
Analysis of the nature and scope of human resource development technical training in industry, government organizations, and labor unions. (Spring)

237 **Designing Technical Training Programs** (3) Wiggs
Applications of instructional systems development design models for technical skills training programs. (Summer)

239 **International Programs in Adult Learning** (3) Staff
The use of adult learning programs (adult education, human resource

development, higher education, etc.), in various parts of the world, as provided by international agencies, multinational companies, and public foundations. Emphasis on national development, social problems, economic growth. (Spring)

240 **Proposal Writing** (3) Ferrante
The preparation of proposals for educational, business, and industrial applications, including those submitted for funding. Many styles and formats are illustrated. Each student will prepare a proposal in cooperation with an organization or agency. (Fall and summer)

241 **Education of the Gifted and Talented** (3) Rashid
Nature and discovery of giftedness, provision for the gifted in educational settings. Research findings and issues.

242 **Fundamentals of Educational Administration** (3) Brown
Organization, structure, and governance of public education; federal, state, and local responsibilities. Basic administrative/leadership theory. Roles and functions of school administrators. (Fall)

243 **Human Relations in Educational Management** (3) Staff
Principles and practices in human relations for teachers, administrators, other school personnel, parents, and community leaders. Current theoretical and research findings; applications to social change; techniques of working with individuals and groups.

246 **Administrative Issues in Urban Education** (3) Staff
Administrative strategies and practices appropriate to problems of urban schools. (Summer)

247 **Postsecondary Career Education** (3) Greenberg
Development, current concepts, agencies involved, problems, and trends in vocational, technical, and occupational education in the United States, with emphasis on the community college. (Spring)

248 **Supervision of Instruction** (3) Staff
Study of interdisciplinary foundations of supervision. Special attention to the function of theory, change, individual and group relationships in organizations, staff influence processes, talent utilization, and evaluation of programs and staff. (Summer)

249 **Drug Treatment and Resources** (3) Staff
Individual, social, and cultural factors related to drug abuse and its treatment.

250 **Counseling Substance Abusers** (3) Staff
Crisis intervention, self-help groups, family therapy; individual and group counseling applied to substance abusers.

251 **Foundations of Counseling** (3) Heddesheimer, Winkler
Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues. (Fall and spring)

252 **Organization and Administration of Counseling Services** (3) Vontress
Principles and procedures for designing and implementing counseling services. Admission by permission of instructor. (Spring)

253 **Individual Appraisal in Counseling** (3) Winkler
Detailed study of individual analysis and appraisal techniques. Development of systematic case study. Prerequisite: Educ 112 or equivalent. (Fall and spring)

254 **The Middle School** (3) Kulawiec
Development, organization, and practices; emphasis on the learner, the teacher, the administrator, the curriculum, and the setting of the school for the preadolescent. (Fall)

255–56 **Secondary Education** (3–3) Kulawiec
Examination of historical, psychological, sociological, and philosophical bases; emphasis on prescriptive implications. Special attention to contemporary problems and practices. (Alternate academic years)

257 **Career Development and Information** (3) Vontress
Theories of career development; factors influencing the world of work;

procedures for evaluating and using socio-personal, educational, and occupational information. (Fall and spring)

258 **Theories and Techniques of Counseling** (3) Heddesheimer, Vontress
Theories and practices of counseling. Prerequisite: 12 semester hours in counseling, including Educ 253 and 257. (Fall and spring)

259 **The Principalship, K–12** (3) Staff
A general introduction to the principalship. Administrative tasks and procedures are stressed, together with the principal's role in handling educational issues and problems. Prerequisite: Educ 242. (Fall)

260 **Supervision in the Elementary and Secondary School** (3) Staff
For experienced teachers and administrators. Review of modern supervisory concepts, including practices in schools. Prerequisite: Educ 248. (Spring)

261 **Practicum in Counseling and Human Development** (3) Rashid and Staff
Separate sections offered for counseling majors and human development majors. Prerequisite: Educ 258 for counseling majors; permission of instructor for human development majors. (Fall and spring)

262 **Internship in Counseling and Human Development** (3) Heddesheimer, Rashid
Separate sections offered for counseling majors and human development majors. Admission by permission of instructor. (Spring)

263 **Human Resource Development: Training and Education** (3) Nadler, Luke, Wiggs
Concepts and purpose, historical backgrounds, roles of human resource development personnel, program areas. Prerequisite: adequate professional preparation or experience in training, education, and development. (Fall and spring)

264 **Design of Training Programs in Human Resource Development** (3) Nadler, Luke, Wiggs
Training, education, and development programs for various client systems will be planned using critical-events conceptual model. Field work. Prerequisite: Educ 263 and permission of instructor. (Spring)

265 **Futurism and Education** (3) Kulawiec
An introductory study of futurism: philosophy, content, methodology, and application. Major concepts are explored through readings, discussion, games, simulations, and films.

267 **Human Sexuality for Counselors** (3) Winkler
The purpose of this course is to increase the awareness and understanding of sexuality as it relates to counseling in contemporary society.

268 **Family Counseling** (3) Winkler
The family as a system, how it affects the client and how the client affects it. Didactic presentations, role playing, and work with simulated families. (Spring)

269–70 **School Business Management** (3–3) Brown
Educ 269: Philosophy, responsibilities, and functions of school business management. Educ 270: Practicum in school business management. Educ 269 is prerequisite to Educ 270. (Academic year)

271 **Policy-Making for Public Education** (3) Boswell, Ferrante
The nature of educational policy: the role of single-interest groups, the courts, legislative bodies, administrative bureaucracies, and professionals in establishing parameters and allocating resources. Analysis of specific techniques of policy formation. (Summer)

272 **Educational Planning** (3) Staff
An examination of the planning movement in education: its historical development and the recent shift in premises, context, and expectations. Different approaches to the planning process; its relationship to the concepts of systems and futurism; participatory, sectorial, and regional aspects; role of research, and overview of main analytical techniques currently in use. (Fall)

273 **Pre-Service Teacher Education** (3) Staff
Program development, governance, issues, trends. (Fall, alternate years)

274 **In-Service Teacher Education** (3) Staff
Continuing professional development of educators, costs and benefits to society, promising programs and practices, current issues. (Spring, alternate years)

275 **School Finance** (3) Brown
Issues in financial support of public education. Local, state, and federal roles. Budget development and administration.

276 **Public Relations in School Administration** (3) Brown
The function, purposes, and resources of school public relations. Development of skills in planning public relations programs and activities. Theory and practice of effective communication.

277 **Dynamics of Change** (3) Boswell
An analysis of the process of change, particularly as it relates to educational policy. Comparison of theories; analytical tools; historical precedents; examples of federal educational policies.

278 **School Law** (3) Staff
Constitutional and statutory provisions for public school education; origin and legal status of the local school unit; nature of the school board; legal status of teachers and administrators; legal rights and responsibilities of parents and pupils. (Spring)

279 **Adult Education** (3) Hoare
Current concepts and objectives, historical development, agencies involved personnel, clients, programs on all levels—community through international. (Fall)

280 **Program Planning in Adult Education** (3) Wiggs
Determining educational needs for adults in school and non-school agencies; designing programs and instruction; budgeting and scheduling of adult programs. Field work with sponsoring agency. Prerequisite: Educ 279 and permission of instructor. (Spring)

281 **Program Evaluation: Theory and Practice** (3) Holmes
A general introduction to the theory of evaluation of social programs. Overview of evaluation models, methodology associated with program evaluation, and examination of evaluation in the context of political and social environments. (Fall)

282 **Introduction to Qualitative Research Methods** (3) Rist
A general introduction to qualitative research procedures in social science research. Application of qualitative methods, design, analysis. (Fall and spring)

283 **Higher Education in the United States** (3) Burns, Greenberg
History, scope, purpose, present status, programs, and trends in higher education in the United States. (Fall and spring)

284 **Administration of Higher Education** (3) Burns, Ferrante, Fife
Government, organization, and administration of colleges and universities, duties of trustees and administrators. (Fall and spring)

285 **Education and National Development** (3) Boswell
Examination of the basic assumption that education contributes to national development. In addition to economic growth and civic identity, what constitutes national development in advanced industrial societies and societies moving to industrialism? What role does education play in promoting this process? (Fall)

286 **Interpretation in the Historic House Museum** (3) Stapp
Seminar integrating advanced practices of museum education with current scholarship in architectural history, material culture, social history, and women's studies. Extensive use of Washington museum resources. Open to undergraduate and graduate students. (Fall)

287–88 **Clinical Study of Reading Problems** (3–3) Staff
For advanced students. Diagnostic and corrective work under supervision. Complete case study approach; selection and evaluation of diagnostic and instructional materials and techniques for permanent file. Prerequisite: Educ 222 and 223, or 224 and 226. (Academic year)

289 **Organization and Administration of Reading Programs** (3) Staff
For principals, assistant principals, supervisors, superintendents and reading teachers. Problems in planning, reorganizing and improving the total reading program. (Fall)

290 **Severe Learning Disabilities in Reading** (3) Staff
For experienced teachers. Case studies of children and/or adults with severe reading problems, planning and implementing instructional programs. Admission by permission of instructor. (Spring)

291 **Educational Facilities Planning** (3) Brown
Principles of school plant planning; site selection; evaluation of existing buildings; adaptation to curricular needs; building operation and maintenance; disposition of surplus facilities; energy and accessibility considerations. (Fall)

292 **Practicum in Program Evaluation** (3 to 6) Holmes
Supervised practical experience in field placements. Admission by permission of instructor. (Fall and spring)

293–94 **Research and Independent Study** (3–3) Staff
Individual research under guidance of a staff member. Program and conferences arranged with an instructor. (Academic year)

295 **Quantitative Methods II: Research Procedures** (3) Paratore, Smith, Holmes
Required of all candidates for master's degrees in education. Analysis of scientific approaches to problems in education; evaluation of research techniques. Prerequisite: Educ 112, 212; or equivalent. (Fall and spring)

297 **Personnel Administration** (3) Brown
Organization and administration of personnel programs for educational institutions. Basic philosophy, principles, responsibilities, and functions; current issues. (Spring)

299–300 **Thesis Research** (3–3) Staff
Required of M.A. in Ed.&H.D. degree candidates writing master's theses. (Fall and spring)

302 **Quantitative Methods III: Inferential Techniques** (3) Holmes, Paratore, Smith
Educ 302 or Stat 105 is required of all doctoral students in education. Prerequisite: Educ 212 or a basic statistics course and permission of instructor. (Fall and spring)

303 **Data Analysis** (3) Staff
Use of computer in data analysis. For doctoral students at the dissertation-planning stage. (Fall and spring)

304 **Practicum in Supervision** (3 to 6) Staff
Practical experience in supervision of instruction. Admission by permission of instructor. (Fall and spring)

305 **Internship: Supervision** (3 to 6) Staff
Service in a school situation directed by the University's faculty and school systems; integration of theory and practice. (Fall and spring)

306 **Quantitative Methods IV: Advanced Research Design** (3) Holmes, Paratore, Smith
Required of all doctoral students in education. Evaluation and application of educational research designs. Prerequisite: Educ 302 or equivalent. (Fall and spring)

310 **Museum Studies** (3) Stapp
Study of the museum's functions and its educational roles. Admission by permission of instructor.

311 **Museum Audiences** (3) Staff
Study of the many audiences of many ages who use and enjoy museums; appropriate museum and outreach practices, grant proposal writing. Admission by permission of instructor.

312 **Internship and Seminar in Museum Education** (6) Stapp
Four-day-a-week placement in education departments in area museums. Supervision and seminar are provided by George Washington University faculty. Admission by permission of instructor.

316 **Recent Developments in Elementary School Social Studies** (3) Moore
For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school social studies curriculum. Admission by permission of instructor.

317 **Recent Developments in Elementary School Science** (3) Staff
For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school science curriculum. Admission by permission of instructor.

320 **Recent Developments in Elementary School Mathematics** (3) Staff
For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school mathematics curriculum. Admission by permission of instructor. (Spring)

321 **Practicum in Curriculum** (3 to 6) Staff
Supervised field experience in curriculum. Admission by permission of instructor. Prerequisite: Educ 205 or 325. (Fall and spring)

322 **Internship: Reading** (3 to 6) Horrworth
Limited to master's degree students in reading education. Experience in a selected area of teaching. Prerequisite: permission of instructor. (Fall and spring)

323 **Internship: Reading** (3 to 6) Staff
Limited to doctoral students in education. Service in a school situation directed by the University's faculty and school systems; integration of theory and practice. (Fall and spring)

324 **Teaching Reading and Study Skills at the College Level** (3) Staff
Evaluation of reading skills at the college level. Development of college reading programs, including diagnostic and teaching techniques, program planning and implementation. Prerequisite: Educ 226 or equivalent, and permission of instructor. (Spring)

325 **Curriculum Theory** (3) Staff
Examination of reviews and research studies in curriculum theory. Focus on trends, values, interpretations, fads, design systems, and evaluation. Prerequisite: Educ 205. (Spring)

328 **Selected Topics in International Education** (3) Moore
Investigation of historical development of international education; research on selected topics of general importance to the field of international education. Admission by permission of instructor. (Fall)

329 **Seminar in Program Evaluation** (3) Holmes
Contemporary problems and issues in evaluation of social programs: design, implementation, analysis, and utilization. (Spring)

330 **Foundations of Early Childhood Education** (3) Staff
Historical developments; philosophy and objectives of nursery schools, kindergartens, and day care centers; exploration of contemporary programs and models, with curriculum implications for schools in the United States and abroad. (Fall)

332 **Early Childhood Curriculum** (3) Staff
Rationale, development, content, approaches, programs, and materials in language arts, mathematics, science, health, social studies, and aesthetic education. (Fall)

333 **Role of the Professional in Early Childhood Education** (3) Staff
Planning, reporting, maintaining records, teacher–child and teacher–family

interaction, diagnosis and evaluations, working with paraprofessionals and parents. Emphasis on total classroom ecology. (Spring)

334 **Community Resources and Materials for the Young Child** (3) Staff
Interaction with community agencies for services, resources, and equipment; physical facilities, play activities, curriculum materials, and methods for teaching the infant and young child. (Spring)

335 **Practicum in Early Childhood Education** (3 to 6) Staff
Supervised professional acctivity in selected early childhood programs; seminar. Prerequisite: 12 semester hours in early childhood education and permission of instructor. (Fall and spring)

336 **Clinical Practicum in Reading** (3 to 6) Horrworth
Supervised clinical experience in testing, tutoring, and teaching. Approximately 120 clinic hours required. Admission by permission of instructor. (Fall and spring)

340 **Methods of Policy Analysis in Education** (3) Holmes, Rist
Modes of analysis employed in the study of educational policy issues. Alternative methods of analysis for policy formation, implementation, and impact assessment. Both theoretical and case study materials are used. Prerequisite: Educ 295. (Fall and spring)

341 **Cognitive Models and Instruction** (3) Rashid
Cognitive models (Guilford, Bruner, etc.) are analyzed as the theoretical basis for planning instructional episodes appropriate at various levels—childhood through adulthood. (Fall)

342 **Language Development** (3) Rashid
Nature of language acquisition and development; emphasis on sociolinguistics and psycholinguistics most pertinent to education. (Spring)

343 **Advanced Studies in Human Development** (3) Rashid
Review and consideration of empirical research studies on selected topics in human development. Issues, instrumentation, and research needs in respect to each topic discussed. Admission by permission of instructor. (Spring)

344 **Adult Development and Aging** (3) Rashid
Theories and research on personality and cognition in adulthood and old age. Emphasis on evaluating research designs and methods and deriving implications of findings for gerontological programs and selected professional roles.

352 **Counseling Interview Skills** (3) Heddesheimer
Acquisition of generic counseling skills through lectures, demonstrations by faculty, role playing, and videotaping. Prerequisite: Educ 251 or permission of instructor. (Fall)

353 **Counseling Older Persons** (3) Finnerty-Fried
Special considerations and counseling emphases in regard to second careers, retirement adjustments, death and dying. (Summer)

354 **Cross-Cultural Counseling** (3) Vontress
Problems of and procedures for counseling culturally different clients. Emphasis on counseling cultural minorities in the United States. (Spring and summer)

355 **Counseling in Groups** (3) Heddesheimer, Winkler
Principles of group dynamics as related to interaction within groups. Techniques and practice in group counseling. (Fall and spring)

356 **Counseling and the Disciplines** (3) Staff
For advanced students in counseling. Explores the psychological, sociological, economic, anthropoligical, and philosophical foundations of counseling. Admission by permission of instructor.

357 **Personal and Social Adjustment** (3) Winkler
Mental health problems; emphasis on needs of counselors, teachers, and others working with children and adolescents. (Fall and spring)

358 **Advanced Theories of Counseling** (3) Vontress
Critical analysis and evaluation of leading counseling theories and consideration of their implications for practice. Intended for Education Specialist and

Doctor of Education degree candidates whose area of concentration is counseling. Admission by permission of instructor. (Fall)

360 **Job Development and Placement** (3) Finnerty-Fried
Job development and modification: placement of disabled persons. (Spring)

361 **Medical Aspects of Rehabilitation** (3) Linkowski
Chronic and traumatic disorders with rehabilitation implications. (Fall)

362 **Client Evaluation in Rehabilitation** (3) Finnerty-Fried
Vocational planning through work-sample assessment, testing, interview, and observation. Prerequisite: Educ 212 or equivalent. (Spring)

363 **Psychosocial Aspects of Rehabilitation** (3) Linkowski
Impact of disabilities and concept of normalization. (Fall)

364 **Administration and Governance of Two-Year Colleges** (3) Greenberg, Ferrante
A study of the community junior college, focusing on administrative patterns and national, regional, state, and local influences, as well as the theory and structure of two-year college organization. (Fall and spring)

365 **Foundations of Rehabilitation** (3) Finnerty-Fried
Survey of history, philosophy, legislation, roles, and services. Visits to selected field sites. (Fall)

366 **Field Work in Rehabilitation Counseling** (3) Staff
Field work of two full days a week; concurrent seminar. (Spring)

367–68 **Internship: Rehabilitation Counseling** (3–3) Linkowski, Finnerty-Fried
Supervised practice of three full days a week; concurrent seminar. Prerequisite: Educ 366. (Academic year)

369 **Professional Issues in Rehabilitation** (3) Linkowski, Finnerty-Fried
Seminar covering professional problems and ethical issues. Prerequisite: Educ 367. (Spring)

370 **Administration of College Student Development Services and Programs** (3) Burns
An overview of student affairs administrative practices, including needs assessment, planning models, budgeting, policy development, program development, facility management, evaluation, and team building. Admission by permission of instructor. (Fall)

372 **Internship in Higher Education** (3 to 6) Greenberg
Supervised experience in selected areas of college teaching: human resource development, adult education. Admission by permission of instructor. (Spring)

373 **The Community/Junior College** (3) Greenberg, Gleazer
The two-year college as it relates to secondary education, four-year colleges, and universities. Objectives, curricula, students, faculty, legal concerns, and special problems of two-year colleges. (Fall and spring)

374 **Current Issues in Higher Education** (3) Ferrante, Elliott
Prerequisite: Educ 283, 284. (Spring)

375 **Foundations of College Student Development** (3) Burns
College student development theories, practices, and problems, including historical overview and human development theories related to college students. (Fall)

376 **Group and Organizational Theories** (3) Burns
Focus on theorists, including Argyris, Blau, Miles, Festinger, and Lewin, and practical application of theories to various organizational settings and individuals. Prerequisite: permission of instructor. (Spring)

377 **Practicum in College Student Development** (3 to 6) Burns
Supervised practical experience in college student development programs. Admission by permission of instructor. (Fall and spring)

378 **Practicum in Teacher Education** (3 to 6) Boswell
For selected experienced teachers. Supervised field work relevant to students' professional needs, to be arranged. (Fall and spring)

379 **Practicum in Adult Learning Programs** (3 to 6) Nadler
Supervised practical experience in various forms of adult education and human resource development. Admission by permission of instructor. (Fall and spring)

381 **Adult Learning** (3) Wiggs, Greenberg
Learning theories as applied to adults in individual and group learning transactions: effect of age on learning; psychological, physical, and social environment in adult education situations. (Fall and spring)

382 **Instructional Strategies in Adult Learning Programs** (3) Greenberg, Luke
Methods, techniques, and devices for adult learning; developing action-oriented learning situations in adult learning programs. (Spring)

383 **Interviewing/Counseling for Human Resource Developers** (3) Staff
Applications of interviewing, coaching, and counseling skills for the human resource development specialist and others in various occupational settings. (Summer)

384 **Evaluation of Adult Learning Programs** (3) Wiggs, Luke
Evaluation design strategies for adult learning programs in business, industry, government, voluntary and community organizations, and agencies. (Fall)

385 **Collective Negotiations in Higher Education** (3) Fife
Theory, practice, problems, and issues in collective negotiations in higher education.

386 **Current Issues in Adult Learning Programs** (3) Luke, Nadler
Primarily for M.A. in Ed.&H.D. degree candidates. Current issues and trends in the fields of adult education and human resource development. Admission of others by permission of instructor. (Spring and summer)

387 **Management of Adult Learning Programs** (3) Wiggs, Nadler
Program administration in school and non-school agencies, staff recruitment and development, fiscal operations, facilities, and maintenance of effective community relations.

388 **Case Studies in Higher Education Administration** (3) Ferrante
An analysis of case studies related to administrative functions in colleges and universities.

389 **Consultant–Client Relationships in Human Resource Development** (3) Nadler, Luke
Examination of the consulting process, consultant–client behaviors, and dilemmas, using theory and field experience for individual and organizational development. Prerequisite: Educ 263, 279; or approval of instructor. (Fall and spring)

390 **Legal Problems in Higher Education** (3) Fife
Investigation of legal problems in higher education related to the legal structure of higher education, religious concerns, students, faculty, and academic programs. (Spring)

391 **College and University Curriculum** (3) Fife
Development, patterns, creative design, issues, problems, evaluation, and trends in the higher education curriculum. (Fall)

392 **Financing Higher Education** (3) Staff
Analysis of private, state, and federal revenue sources; student aid, program budgets, and financial methods and practices. (Spring)

394 **College and University Governance** (3) Ferrante
Organizational and administrative structures, patterns, and relationships in higher education. Prerequisite: Educ 284. (Fall)

395 **Problems and Practices in Educational Administrative Organization** (3 to 6) Ferrante, Fife, Greenberg
Application of principles and practices concerned with change and evaluation of educational administration

396 **Internship: Higher Education Administration** (3 to 6) Greenberg
Service in a higher education situation directed by the University and the cooperating institution to integrate theory and practice. (Fall and spring)

397 **Internship: Administration** (3 to 6) — Brown
Service in an educational institution or education-related program directed by the University's faculty. (Fall and spring)

399 **Seminar: Applied Educational Administration** (3 to 6) — Brown
Application of the theories and principles of administration to public and private schools. Field experience in a phase of administration and supervision. Admission by permission of instructor. (Fall and spring)

Fourth Group

A master's degree from an accredited institution is prerequisite to all fourth-group courses. All fourth-group seminars are open to doctoral candidates or other post-master's degree students with approval of instructor. Study is individually planned on the basis of previous study and experience in the subject field to attain an advanced level of competence and to meet identified professional needs or field requirements.

Each of the following courses is offered fall and spring. Each course except Educ 401 may be repeated for credit.

401 **Advanced Study: Ideas, Issues, and Practices in Education** (3) — Boswell, Phelps, Rist
For precandidates for the Ed.D. Alternative means of responding to the complexities of the educational process. Topics will vary, but will concern education as an individual process and as sociocultural preservation and renewal.

402 **Seminar: Western Educational Thought** (arr.) — Boswell, Darland
(Formerly Educ 401)

405 **Seminar: Human Growth and Development** (arr.) — Rashid

411 **Seminar: Elementary Education** (arr.) — Staff

413 **Seminar: Secondary Education** (arr.) — Kulawiec

421 **Seminar: Adult Education** (arr.) — Luke, Nadler, Wiggs

422 **Seminar: Higher Education Administration** (arr.) — Greenberg, Ferrante, Gleazer

424 **Seminar: College Student Development** (arr.) — Burns

425 **Seminar: Teacher Education** (arr.) — Boswell

427 **Seminar: Human Resource Development** (arr.) — Luke, Nadler, Wiggs

432 **Seminar: Administration, Curriculum, and Supervision** (arr.) — Brown

441–42 **Doctoral Internship in Counseling** (3–3) — Heddesheimer

443 **Seminar: Counseling** (arr.) — Staff

445 **Seminar: Research and Evaluation** (arr.) — Holmes, Paratore, Smith

446 **Seminar: Reading** (arr.) — Staff

490 **Pre-Dissertation Seminar** (3 to 6) — Staff
Required of all Ed.D. degree candidates. Approval of the dissertation research design is necessary for successful completion of the seminar. Admission by permission of instructor.

491 **Dissertation Research** (arr.) — Staff
Preparation of a research outline; research and writing of an approved doctoral dissertation under the direction of major advisor and dissertation committee. Prerequisite: Educ 490.

EDUCATION POLICY—DOCTORAL PROGRAM

Doctoral Committee on Education Policy

A.V. Adams *(Chairman)*, J.R. Henig, A.D. Kirsch, C.J. Lange, M.N. Rashid, C.T. Stewart, Jr., J.L. Tropea

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Doctor of Philosophy in the field of education policy. The program is directed by a committee whose members are drawn from the School of Education and Human Development and from the Departments of Economics, Political Science, Psychology, Sociology, and Statistics.

This program is concerned with policy research and analysis as it relates to education, broadly conceived. It is intended for those who wish to pursue or continue academic careers or careers in policy-making positions. The program is open only to current students. For entering students, education policy is a field in the doctoral program in public policy.

201–2 **Seminar: Current Issues in Education Policy** (3–3) Adams
Review of interdisciplinary literature relating to current education policy issues with emphasis on use of research and analysis in formulating and evaluating policy.

222 **Seminar: Topics in Education Policy** (3) Adams
Intensive interdisciplinary study of special topics in education policy.

290 **Advanced Studies in Education Policy** (3) Adams
Supervised interdisciplinary study and field work in a selected policy area.

399 **Dissertation Research** (arr.) Staff

ENGLISH

Professors P.H. Highfill, Jr., J.G. Allee, Jr., J.P. Reesing, Jr., R.N. Ganz, Jr., J.H. Maddox, A.E. Claeyssens, Jr.
Associate Professors R.C. Rutledge, J.A. Quitslund *(Chairman)*, J.A.A. Plotz, C.W. Sten, G.R. Bozzini, R.L. Combs, G. Paster, D. McAleavey, O.A. Seavey, G. Carter
Associate Professorial Lecturers E.R. Garner, M. Morrison
Assistant Professors A. Romines, M.V. Dow, B. Morgan
Adjunct Assistant Professors F.C. Reid, S.M. Wright
Assistant Professorial Lecturers N.S. Limprecht, T.G. Wallace, M. Strom
Adjunct Instructors M.C. Edmondson, E. Echeverria, M. Kirkland, C. Meloni, S. Thompson, J.K. Donaldson, Jr., A.J.B. Covarrubias, S.M. Spolarich, M.B. Bandas *(Visiting)*, P. Connerton, M.E. Evans, C.L. Iacobelli, M.A.P. Saunders, C.J. Demnitz *(Visiting)*
Lecturers M.J. Lowel, J.S. Varden, D. Scarboro
Jenny McKean Moore Visiting Lecturer in Creative Writing J.A. Alvarez

Bachelor of Arts with a major in American literature or English literature (field-of-study) or American literature, English literature, or literature in English (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.)

2. Prerequisite courses—Engl 51–52 or 61–62 or 71–72 or 191–92.

3. Required courses in related areas—(a) as appropriate, 3–12 semester hours, or waiver of level 4, of a foreign language (Hebrew, Greek, Latin, French, German, Italian, Russian, or Spanish); (b) 6 semester hours of philosophy and/or religion; (c) 6 semester hours of history (English, American, European, or world).

4. Required for the major:

(a) *Field-of-study major*—a major examination must be passed in either American or English literature at the end of the senior year. Although no set pattern of courses is prescribed, students are expected to engage themselves with writers and works from the whole chronological span of American literature or English literature. Proseminars in American Literature, Engl 199–200, and in English Literature, Engl 195–96, assist students in their preparation for the major examination. Students who wish to be candidates for graduation with Special Honors in either American or English literature must be in the field-of-study major.

(b) *Departmental major*—Engl 120 and 27 semester hours of second-group courses, of which no more than 6 hours may be taken in creative writing or composition. The 27 hours of second-group courses are as follows for the concentrations within the departmental major:

American literature—Engl 160; either Engl 161–62 or 163 and 167; 3 hours in English literature; and 15 additional hours of courses in the department, of which at least 9 must be in American literature.

English literature—Engl 194; Engl 112, 128, or 130; 3 hours in American literature; and 18 additional hours of courses in the department, of which at least 12 must be in English literature.

Literature in English—One course from each of the following categories:

1. Major authors: Chaucer, Shakespeare, Milton (Engl 112, 127, 128, or 130).
2. British and American literature before 1800 (Engl 111, 112, 125, 129, 130, 131, 132, 153, 155, or 160)
3. 19th-century British and American literature (Engl 133, 134, 135, 136, 154, 161, 162, 163, 167).
4. 20th-century British and American literature (Engl 137, 138, 139, 157, 158, 164, 165, 166, 168, 177, or 178).

With departmental approval, courses with appropriate subject matter may be taken in place of those specified above. Students take 15 additional hours of second-group courses, of which 6 may be earned by studying literature in a foreign language.

Minor in literature in English—15 hours of second-group literature courses, chosen in consultation with an advisor in the department.

Minor in creative writing—15 hours of second-group courses offered by the department, including Engl 102 and at least 9 additional hours of creative writing.

Master of Arts in the field of American literature or Master of Arts in the field of English literature—Prerequisite: a Bachelor of Arts degree with an undergraduate major in English or American literature, or 24 semester hours in English or American literature above the sophomore level.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) 24 semester hours of course work planned in consultation with the department advisor; (2) a Master's Comprehensive Examination in American or English literature; and (3) *either* a master's thesis (6 semester hours) on an approved topic, directed by a member of the department's graduate faculty, *or*, with the approval of the department's director of graduate studies, 12 additional semester hours of course work in lieu of the thesis. Students must maintain a quality-point index of at least 3.25.

Doctor of Philosophy in the field of American literature—Required: the general requirements stated under the Graduate School of Arts and Sciences; Level Two proficiency in an appropriate foreign language, or Level One proficiency in two appropriate foreign languages; the passing of General Examinations in the following four fields: (1) early American literature—to 1815, (2) 1815–1900, (3) 1900 to present, (4) a fourth field, which may be either literary or interdisciplinary. Each student plans a program in consultation with a departmental committee. Students must maintain a quality-point index of at least 3.25.

Doctor of Philosophy in the field of English literature—Required: the general requirements stated under the Graduate School of Arts and Sciences; Level Two proficiency in an appropriate foreign language, or Level One proficiency in two appropriate foreign languages; the passing of General Examinations in four of the eight following fields: (1) beginnings to 1500, linguistics, and history of the language; (2) 1500–1660; (3) 1660–1800; (4) 1800–1900; (5) 1900 to present; (6) drama, including Shakespeare; (7) criticism; (8) American literature—one of the first three fields listed above under Doctor of Philosophy in the field of American literature. Each student plans a program in consultation with a departmental committee. Students must maintain a quality-point index of at least 3.25.

Bachelor of Arts in Education and Human Development with a teaching field in English—Prerequisite: the education curriculum; required: the English option and the professional courses stated under the School of Education and Human Development.

Departmental prerequisite: Engl 9 or 10 is prerequisite to all other courses in English. A 6-semester-hour course in literature, or equivalent, or permission of the instructor, is prerequisite for admission to all second-group courses in English except Engl 115, 117, 160–61–62, and 191–92.

Scores on the College Board English Composition Achievement Test or the Test of Standard Written English determine placement in Engl 9 or 10 and eligibility to waive the requirement, according to the following schedule:

Achievement Test		*TSWE*	*Placement*
650 and above	**or**	58 and above	Waives Engl 10
520–649	**or**	45–57	Engl 10
430–519	**or**	40–44	Determined by GW Placement Exam
429 and below	**or**	39 and below	Engl 9

The admission of international students to any English course is determined by the EFL Placement Test. Students should apply to the office of English for International Students to take this test (see Students from Foreign Institutions, under Admissions).

ENGLISH AS A FOREIGN LANGUAGE

English for International Students offers several noncredit special courses in addition to those listed below. For further information, request a program brochure from English for International Students, George Washington University, Academic Center T604, Washington, D.C. 20052.

First Group

15 **Intensive Basic English** (0) Wright and Staff
Introduction of basic grammatical structures and practical vocabulary, integrating speaking, listening, reading, and writing skills. Ample practice is provided in the skill areas. Course meets fifteen class hours and three monitored laboratory hours per week. Students registered for EFL 15 will not be permitted to register for any other academic course. Tuition is charged at the rate of seven semester hours; laboratory fee, $60.

20 **Intensive Lower-Intermediate English** (0) Wright and Staff
Continued basic grammar, reading, and vocabulary development; emphasis on speaking and listening skills. Course meets seventeen class hours and three monitored laboratory hours per week. Students registered in EFL 20 will not ordinarily be permitted to register for any other academic course. Tuition is charged at the rate of seven semester hours; laboratory fee, $60.

30 **Intensive Intermediate English** (0) Wright and Staff
Introduction of complex grammatical structures, paragraph-level writing, intensive reading, further vocabulary development, listening comprehension and note-taking practice, and conversation skills. Course meets twenty class hours and two laboratory hours per week. Students registered in EFL 30 will not be permitted to take additional academic work without approval of the advisor. Tuition is charged at the rate of seven semester hours; laboratory fee, $30.

40 **Intensive Higher-Intermediate English** (0) Wright and Staff
Comprehensive review of grammatical structures; composition focusing on outlining and techniques of exposition; strategies for analysis of unadapted reading material; oral communication skills. Twenty hours per week. Students registered in EFL 40 will not be permitted to take additional academic work without approval of the advisor. Special-purpose sections are offered with technical emphasis. Tuition is charged at the rate of seven semester hours

45 **Semi-Intensive Higher-Intermediate English** (0) Wright and Staff
Practice in composition writing; selective review of problematic grammatical structures; introduction to research techniques; development of reading, speaking, and study skills and expansion of vocabulary through use of unadapted reading materials. Ten class hours per week. Tuition is charged at the rate of five semester hours.

50 **English Composition/Research Methods for International Students** (3) — Wright and Staff
An advanced-level composition course for international students showing a high degree of academic proficiency in English. Four class hours per week. This course can be taken by international students in lieu of Engl 9 or 10. Special-purpose sections are offered with business or technical emphasis. Special fee, $25.

60 **Advanced Oral Communication** (3) — Wright and Staff
For international students who demonstrate high proficiency in English. Designed to develop conversational fluency through use of persuasive and informative speaking and to provide instruction in interviewing techniques and in leading and participating in group discussions. Instructional resources include contemporary topics from newspaper and magazine articles, films, interviews, and guest lectures. Meets four hours per week. Special fee, $25.

61 **Advanced English Language Skills** (3) — Echeverria, Covarrubias
(Formerly U.S. Press and Culture, no credit)
Advanced English language skills course, involving a study of currents in American thought, culture, and civilization. Discussions based on selected texts and periodical literature. For students with scores of 45 or above on the EFL Placement Test. Meets four hours per week. Special fee, $25.

70 **Advanced Grammar Review** (0) — Wright and Staff
A comprehensive review of English grammar, designed to identify and explain features of English grammar that are troublesome to the student. Meets five hours per week. Tuition is charged at the rate of three semester hours.

ENGLISH COMPOSITION

First Group

9 **English Composition: Language as Communication** (3) — Dow and Staff
Intensive grammar and composition course for students inadequately prepared for Engl 10. Detailed instruction, drill, and exercises in basic structure and writing paragraphs; also includes content covered in Engl 10. Class meets five hours per week. Special fee, $25. (Fall and spring)

10 **English Composition: Language as Communication** (3) — Dow and Staff
Study and practice of expository techniques; emphasis on the rhetorical complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure. At least one section is reserved for residents of Thurston Hall and is designed to integrate student experience with the study and practice of expository writing. (Fall and spring)

11 **English Composition: Language and the Arts and Sciences** (3) — Dow and Staff
Study and practice of expository and argumentative techniques; emphasis on the rhetorical complexities of the sentence and diction and on logical thought by analysis of selected readings on the nature of language and the arts and sciences. A substantial research paper is required. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 11 cannot receive credit for Engl 12 or 13. (Fall and spring)

12 **English Composition: Language in Literature** (3) — Dow and Staff
Study and practice of expository and argumentative techniques through critical writing; emphasis on the rhetorical complexities of stylistics in the sentence and diction by the study of literary genres, and of the use of language in literature. A substantial research paper is required. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 12 cannot receive credit for Engl 11 or 13. (Fall and spring)

13 **English Composition: Language and Ideas** (3) — Staff
Study and practice of expository and argumentative techniques; emphasis on

the rhetorical problems raised by different intellectual disciplines and different historical milieus. A substantial research paper is required. Prerequisite: Engl 9 or 10. To be taken only in conjunction with Hmn 1. (Fall and spring)

Second Group

100 **Expository Writing in Accounting** (3) Lowel and Staff
Business writing with a focus on accounting; selected readings; weekly exercises on designated topics. Prerequisite: Engl 11 and sophomore status. (Fall and spring)

101 **Advanced Expository Writing** (3) Staff
Types of expository writing; weekly assignments based on students' needs; particular attention may be given to problems in the writing of term papers or graduate theses. Prerequisite: Engl 11 or 12. (Fall and spring)

110 **Expository Writing for the Engineering Professions** (3) Staff
Weekly exercises based on students' individual needs; particular attention given to problems in writing for technically sophisticated readers. Selected readings. (Fall and spring)

Third Group

201 **The Teaching of Composition** (3) Dow
Exploration of current theories governing the teaching of writing; weekly writing assignments; supervised experience in the classroom and Writing Laboratory. (Fall)

CREATIVE WRITING

102 **Introduction to Creative Writing** (3) McAleavey and Staff
Initial course in poetry and/or fiction writing. Basic problems and techniques; examples of modern approaches; weekly writing assignments; workshop and/or conference discussion of student writing. Prerequisite: Engl 11 or 12, consent of instructor. Material fee, $5. Class size limited to 15 students. (Fall and spring)

103 **The Writing of Fiction—The Short Story** (3) Staff
Prerequisite: Engl 102; consent of instructor. The student should submit a writing sample to the instructor before registration. (Fall)

104 **The Writing of Poetry** (3) McAleavey and Staff
Study of imagination, diction, and poetic form. Exercises, readings in recent traditions and new modes, projects, and conferences; workshop discussion of students' own poetry. Prerequisite: Engl 102; consent of instructor. Writing sample to be submitted before registration. Material fee, $5. Class size limited to 15 students. May be repeated for credit. (Spring)

105–6 **The Writing of Plays** (3–3) Claeyssens
Same as CmTr 105–6. Prerequisite: Engl 11 or 12; consent of instructor. The student should submit a writing sample to the instructor before registration. Material fee, $5 per semester. (Academic year)

107 **The Writing of Fiction—The Novel** (3) Claeyssens
Prerequisite: Engl 102 or 103; consent of instructor. The student should submit a writing sample to the instructor before registration. Material fee, $5. (Spring)

108 **Advanced Poetry Writing** (3) McAleavey
Emphasis on development of voice, style, subject; intensive study of recent traditions and new modes. Workshop format, conferences. Prerequisite: Engl 104; consent of instructor. Material fee, $5. Class size limited to 15 students. May be repeated for credit.

ENGLISH LITERATURE

First Group

51–52 **Introduction to English Literature** (3–3) Rutledge and Staff
Representative works by major authors studied in their historical context; discussion of recurrent themes and introduction to various types and forms of imaginative literature. Engl 51: Middle Ages through the 18th century. Engl 52: 19th and 20th centuries. (Academic year)

61 **Tragedy** (3) Carter, Paster
Modes of tragedy as developed in drama, nondramatic verse, and prose fiction in literature from ancient to modern times—Book of Job to Beckett.

62 **Comedy** (3) Carter, Paster
Modes of comedy as developed in drama, nondramatic verse, and prose fiction—Chaucer to Borges.

Second Group

111 **Medieval English Literature—Exclusive of Chaucer** (3) Allee

112 **Chaucer** (3) Allee
(Spring)

115 **History of the English Language** (3) Allee
Development of the English language in a historical treatment of English grammar.

116 **Medieval Legend and Saga** (3) Allee
Celtic and Norse. (Fall)

117 **Advanced English Syntax** (3) Allee
Study of English grammar through various approaches. Emphasis on syntax, including analysis of special syntactical problems. (Fall)

120 **Practical Criticism** (3) Staff
Uses of language and complex shapes of thought in literature; introduction to mature study and full enjoyment of poetry, fiction, and drama. (Fall and spring)

123 **Principles of Literary Criticism** (3) Carter
A study of ideas about the value of literature and methods of interpretation from Aristotle to the present, using *King Lear* as the central literary text.

125 **Elizabethan Verse and Prose** (3) Quitslund
Major authors from the late 16th century (e.g., Sidney, Spenser, Hooker, Nashe, Shakespeare, Donne), seen in relation to Continental Renaissance culture.

127–28 **Shakespeare** (3–3) Highfill
Development of dramatic forms and recurrent themes. Engl 127: histories and comedies. Engl 128: tragedies. (Academic year)

129 **The Early 17th Century** (3) Reesing
Poetry and prose to 1660, exclusive of Milton. (Fall)

130 **Milton** (3) Reesing
(Spring)

131–32 **English Literature, 1660–1780** (3–3) Highfill
Poetry and prose of the Neoclassic period. Engl 131: 1660–1740. Engl 132: 1740–1780. (Academic year)

133–34 **The Romantic Movement** (3–3) Combs, Plotz
Major figures and topics in English and Continental romanticism. Engl 133: Blake, Wordsworth, Coleridge, Lamb, and others. Engl 134: Byron, Shelley, Keats, Hazlitt, DeQuincey, and others. (Engl 133—fall)

135–36 **Victorian Literature** (3–3) Carter
Engl 135: 1830–1865—E. Brontë, Dickens; Tennyson, Browning, Arnold; Darwin, Carlyle, Ruskin. Engl 136: 1865–1900—Eliot, Hardy, Conrad; Swinburne, the Rossettis, Morris; Pater, Wilde, the Nineties. (Engl 135—fall)

137–38 **The 20th Century** (3–3) Maddox
Engl 137: Emergence of modernism in poetry, fiction, and criticism. Engl 138: Literature since the 1930s. (Engl 137—fall)

139 **20th-Century Irish Literature** (3) Maddox
The achievements of Irish writers between 1890 and 1939, with emphasis on Yeats and Joyce.

145–46 **Special Topics in English Literature** (3–3) Staff
Courses in English literature and related subjects reflecting current interests of individual faculty members. Topics announced in the *Schedule of Classes*; may be repeated for credit provided the topic differs.

153–54 **The English Novel** (3–3) Maddox
Major novelists. Engl 153: 18th century. Engl 154: 19th century.

155–56 **The English Drama** (3–3) Paster, Highfill
Engl 155: Shakespeare's contemporaries. Engl 156: Historical survey, 1660 to present. (Engl 155—fall)

157 **20th-Century Drama** (3) Paster
Representative continental, English, and American plays of the 20th century.

158 **20th-Century British Fiction** (3)

183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy
Same as Fren/Ger/Hist/Rel 183 and Art 187.

191–92 **Introduction to European Literature** (3–3) Paster, Seavey
Selected major works in various genres, read in translation and in entirety. Engl 191: *Iliad* and *Aeneid*; dramas from ancient to modern times. Engl 192: Plato, Ovid, and Dante; medieval saga and romance; prose fiction from Cervantes to Mann. Open to freshmen and sophomores. May be taken to satisfy the requirement for meaningful initiation into the humanities. (Engl 192—spring)

194 **History of English Literature** (3) Reesing
(Spring)

195–96 **Proseminar in English Literature** (3–3) Paster, Quitslund
For field-of-study major in English literature. Themes and concerns basic to the English literary tradition that draw connections between diverse works from the Old English period to recent times. (Academic year)

197 **Independent Study** (3) Quitslund and Staff
For exceptional students whose academic objectives cannot be accommodated in regular courses. Students must obtain the Chairman's approval and arrange for supervision by an appropriate member of the department. (Fall and spring)

198 **Senior Honors Thesis** (3) Ganz and Staff
Independent study. Under the guidance of an instructor, the student writes a thesis on an approved topic. Open to qualified seniors in the field-of-study major in English literature. (Fall and spring)

Third Group

212 **Studies in Chaucer** (3) Allee

213 **Old English** (3) Allee
Old English grammar and readings.

214 **Beowulf** (3) Allee
Prerequisite: Engl 213 or equivalent.

215 **Viking Background for Medieval English** (3) Allee

219 **Research Methods and Bibliographical Materials** (3) Allee
Principal bibliographical sources and typical problems in research. (Spring)

223 **Studies in Literary Criticism** (3) Carter
(Fall)

226 **Studies in 16th-Century English Literature** (3) Quitslund

227–28 **Studies in Shakespeare and his Contemporaries** (3–3) Paster

229 **Studies in English Literature, 1600–1660** (3) Reesing
Chief figures exclusive of Milton. (Fall)

230 **Studies in Milton** (3) Reesing
(Fall)

231–32 **Studies in English Literature, 1660–1780** (3–3) Highfill

233–34 **Studies in the Romantic Movement** (3–3) Plotz

235–36 **Studies in Victorian Literature** (3–3) Carter

237–38 **Studies in 20th-Century Literature** (3–3) Staff
(Engl 238—fall)

253–54 **Seminar: The English Novel** (3–3) Maddox

256 **Studies in Dramatic and Theatrical History** (3) Highfill
Studies in drama and theater of the Restoration and 18th century. Held at the Folger Shakespeare Library.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. Institute policies are set by a central committee on which each member institution is represented. Doctoral students enrolled in one of the Institute seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301–12. Students wishing to register for these courses should consult the chairman of the English Department.

301–12 **Folger Institute Seminars** (3) Staff
Topics will be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

AMERICAN LITERATURE

First Group

71–72 **Introduction to American Literature** (3–3) Sten and Staff
Historical survey. Engl 71: From beginnings to the civil War. Engl 72: From the Civil War to present. (Academic year)

Second Group

120 **Practical Criticism** (3) Staff
Uses of language and complex shapes of thought in literature; introduction to mature study and full enjoyment of poetry, fiction, and drama. (Fall and spring)

160–61–62 **Studies in American Literature** (3–3–3) Seavoy, Sten, Romines
Same as AmCv 160–61–62. The shaping of America's literary and cultural traditions as shown by major writers. Engl 160: The Colonial and Early National Periods: Bradstreet, Cotton Mather, Edwards, Franklin, Crevecoeur, and others. Engl 161: The Romantic Period: Poe, Emerson, Hawthorne, Melville, Thoreau, Whitman, Dickinson, and others. Engl 162: The Realist Period: Twain, James, Crane, Howells, Wharton, Chopin, Robinson, and others. (Engl 160, 162—fall; 161—spring)

163–64 **American Poetry** (3–3) Ganz, Combs, McAleavey
Close examination of major American poems. Engl 163: From the beginnings through the early 20th century: works by Bradstreet, Taylor, Poe, Emerson, Whitman, Dickinson, Robinson, Frost, and others. Engl 164: The 20th-century

modernist poets: Stevens, Pound, Williams, Eliot, Ransom, Cummings, Crane, and others. (Academic year)

165–66 **American Drama** (3–3) Combs, Claeyssens
Historical and critical study of significant plays and forms. Engl 165: The life and works of Eugene O'Neill and the dramatic techniques of Ibsen, Chekhov, and Strindberg that helped to shape 20th-century American drama; biographical and critical readings included. Engl 166: Significant and representative works of American theater, 1935–1982, including plays by Clifford Odets, Lillian Hellman, William Saroyan, Thornton Wilder, Arthur Miller, William Inge, Tennessee Williams, Eugene O'Neill, Carson McCullers, and Lorraine Hansberry, and outstanding examples of musical comedy. (Academic year)

167–68 **The American Novel** (3–3) Sten, Maddox
Historical and critical study of major works in the American novelistic tradition. Engl 167: From beginnings through the 19th century: Hawthorne, Melville, James, Twain, Dreiser, Chopin, and others. Engl 168: The 20th century: Wharton, Anderson, Hemingway, Fitzgerald, Lewis, Faulkner, and others. (Academic year)

170 **The American Short Story** (3) Combs
An extensive survey of short fiction by a wide variety of writers of the 19th and 20th centuries, about half of them American; readings on the art of the short story by writers and literary critics included. (Spring)

171–72 **Major American Writers** (3–3) Staff
Each course may be repeated for credit provided the topic differs. Topics announced in the *Schedule of Classes*.

173–74 **Selected Literary Movements** (3–3) Staff
Each course may be repeated for credit provided the topic differs. Topics announced in the *Schedule of Classes*. (Engl 174—fall)

175–76 **Special Topics in American Literature** (3–3) Staff
Courses in American literature and related subjects reflecting current interests of individual faculty members. Topics announced in the *Schedule of Classes*; may be repeated for credit provided the topic differs.

177–78 **Contemporary American Literature** (3–3) Ganz, Claeyssens, McAleavey
Major and representative works, 1946–1980. Engl 177: poetry, fiction, and nonfiction by Flannery O'Connor, Ginsberg, Kerouac, Rich, Lowell, Plath, Mailer, Roethke, Baraka, Berryman, Ashbery, and others. Engl 178: essay, short story, and novel: Robert Penn Warren, J.D. Salinger, James Agee, E.B. White, Cheever, Nabokov, Welty, Wilder, Tillie Olsen, Bellow, John McPhee, and others. (Academic year)

181–82 **TBA** (3–3) TBA
Two special courses offered each year by the Jenny McKean Moore Visiting Lecturer in Creative Writing. Each course may be repeated for credit. (Academic year)

197 **Independent Study** (3) Quitslund and Staff
For exceptional students whose academic objectives cannot be accommodated in regular courses. Students must obtain the Chairman's approval and arrange for supervision by an appropriate member of the department. (Fall and spring)

198 **Senior Honors Thesis** (3) Ganz and Staff
Independent study. Under the guidance of an instructor, the student writes a thesis on an approved topic. Open to qualified seniors in the field-of-study major in American literature. (Fall and spring)

199–200 **Proseminar in American Literature** (3–3) Romines
For field-of-study majors in American literature. Readings, conferences, and group discussions. (Academic year)

Third Group

219 **Research Methods and Bibliographical Materials** (3) Allee
Principal bibliographical sources and typical problems in research. (Spring)

263–64 **Seminar: American Poetry** (3–3) McAleavey
American poets and critics of poetry.

267–68 **Seminar: American Fiction** (3–3) Sten
Research and critical reading: fiction and the criticism of fiction. (Engl 268—fall)

281–82 **Seminar: Early American Literature** (3–3) Seavey
(Engl 282—spring)

283–84 **Seminar: American Romanticism** (3–3) Sten
Engl 283: Melville—the early fiction. Engl 284: Emerson, Thoreau, and the Concord Group: the intellectual background and the literary achievement. (Engl 283—spring)

285–86 **Seminar: American Realism, 1865–1915** (3–3) Romines, Sten
Realistic fiction in various contexts—literary, intellectual, cultural. (Academic year)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ENVIRONMENTAL AND RESOURCE POLICY—GRADUATE PROGRAM

Committee on Environmental and Resource Policy
H.C. Merchant *(Academic Director)*, J. Millar, T. Vandemer, A. Viterito, H.B. Wagner

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Master of Arts in the field of public policy with a concentration in environmental and resource policy. The program is directed by the Committee on Environmental and Resource Policy and draws upon faculty and relevant courses from the various departments within the University.

The Environmental and Resource Policy Program presents in its core requirement a graduate-level examination of the specific areas that affect decisions made in the broad area of environmental and resource policy. This material includes the analytic tools required for decisions leading to effective policy regarding the environment and natural resources. In addition to mastering the core material, a student is also expected to develop specific competence in an area of particular interest by choosing an approved elective field. Prospective candidates should consult with the director of the Environmental and Resource Policy Program.

Master of Arts in the field of public policy with a concentration in environmental and resource policy—Prerequisite: a bachelor's degree with a *B* average (or equivalent) in a social science, natural science, or other relevant area from an accredited college or university and an introductory course in statistics. Presentation of Graduate Record Examination scores is strongly recommended.

Required:

(a) The general requirements stated under the Graduate School of Arts and Sciences

(b) Twenty-six hours of core courses selected from the following (students whose backgrounds include some of these courses may substitute additional courses in the elective field): BiSc/Chem/Phys 201–2; Econ 217, 237; EnHe 240; E&RP 210; PSc 203; Psyc 244; Stat 183 (or other appropriate statistical techniques course).

(c) Twelve hours of courses selected from those listed in one of the following elective fields. (Students are required to meet departmental prerequisites before enrolling in courses; check the conditions stated under the Graduate School of Arts and Sciences for receiving graduate credit for advanced undergraduate courses.)

Earth Sciences: Geog 107, 108, 136, 137, 219; Geol 105, 122, 128, 131, 175; Phil 271

Ecology: BiSc 140, 141, 142, 143, 144, 150, 167, 206, 208, 242, 243; Geog 290; Phil 271

Energy: Econ 235; EAd 221 (Environmental Management); Geog 134; Phil 271; PSc 222, 223, 252, 288, 289 (the School of Engineering and Applied Science offers many technical courses relevant to this area, and some may be included in this program)

Resource Management: Econ 161, 162; Geog 132, 133, 222, 230, 290; Phil 271; Soc 127

(d) Comprehensive Project—Taken at the completion of the student's program, the comprehensive project is the investigation of a specific problem in environmental and resource policy and the development of a proposed solution in a manner that integrates the core curriculum with the course work in the elective field.

210 **Seminar in Environmental and Resource Policy** (3) Staff
Limited to candidates in the Environmental and Resource Policy program; capstone course integrating the core and elective areas of the program. Provides practical experience in decision making and serves as preparation for the comprehensive project.

ENVIRONMENTAL SCIENCE—GRADUATE PROGRAM

Academic Committee: H. Merchant *(Director)*, J. Millar, T. Vandemer, A. Viterito, H.B. Wagner

The Graduate School of Arts and Sciences offers a multidisciplinary program leading to the degree of Master of Science in the field of environmental science. The curriculum is designed to provide an understanding of the environment with an emphasis on problems of the work place.

Master of Science in the field of environmental science—Prerequisite: a bachelor's degree with a *B* average from an accredited college or University.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 36 semester hours of course work. The required curriculum is Chem 205; Econ 217, 237; EnHe 201, 240, 256, 270, 301; PSc 224; Stat 127. An additional 6 credits are selected in consultation with the advisor. Each student must pass a Master's Comprehensive Examination.

ENVIRONMENTAL HEALTH

201 **Introduction to Epidemiology** (3)
Principles and methodology of epidemiology and biostatistics. Ecological approach to health and disease, including parasitology and mycology.

240 **Environmental Impact Statement Procedures and Environmental Law** (3)
The rationale for environmental impact statements from the viewpoint of the nature and origins of environmental concerns. Government agencies responsible for environmental impact statements; current statutes and regulations pertaining to the environment.

256 **Introduction to Environmental Health** (3)
Organizations, functions, current practices, and regulations at all levels to control the environment. Economic impact upon society and industry in carrying out control and preventive practices.

270 **Industrial Hygiene** (3)
Industrial health hazards: chemical exposure to toxic dusts, metallic fumes and vapors, gases, and organic compounds; physical hazards such as high- and low-temperature biological effects, radiation (electromagnetic, ultravio-

let, ionizing), illumination, sound, pressure, and particulate pollution; prevention and control of industrial health hazards.

301 **Applied Epidemiology and Environmental Health** (3)
Lectures, seminars, and case studies. Epidemiological solutions to health problems of the community.

ENVIRONMENTAL STUDIES

Committee on Environmental Studies
H. Merchant (*Chairman*), W.C. Parke, W.E. Schmidt, A. Viterito, A.M. Yezer

Columbian College of Arts and Sciences offers interdepartmental programs in environmental studies leading to the degree of Bachelor of Arts or Bachelor of Science. By emphasizing the social sciences, the program leading to the degree of Bachelor of Arts is designed to serve the student whose participation in the environmental decision-making process involves integrating information of a less technical nature. The program leading to the degree of Bachelor of Science prepares a student for a role in environmental decision making that involves the interpretation and use of technical information.

Bachelor of Arts with a major in environmental studies (departmental)—The following requirements must be fulfilled:

1. The general requirements stated uncer Columbian College of Arts and Sciences.
2. Prerequisite courses (qualified students may substitute advanced courses with departmental permission, in order to include more elective courses in their program):
   (a) Statistics—Stat 91.
   (b) Natural sciences—6–8 semester hours selected from BiSc 3–4, 11–12; Chem 11–12; Geol 1–2; or Phys 1, 2, 5, 6. Courses designated for non-science majors must be passed with a grade of *A* or *B* to be accepted toward fulfilling the introductory natural science requirement. This includes BiSc 3–4 and Geol 1–2.
   (c) Social sciences—Econ 1–2, plus 6 semester hours selected from Anth 1–2; Geog 1, 2, 3; PSc 1, 2; Psyc 1, 5–6; or Soc 1, 2.
3. Required courses in the major (51 semester hours):
   (a) BiSc 140; Econ 136; Geog 132.
   (b) Eight semester hours selected from BiSc 101, 102, 103, 105, 106, 107, 108, 109, 110, 111, 120, 123, 124, 125, 127, 128, 135, 141, 142, 143, 144, 145, 149, 150, 161, 167, 168, 185, 208, 242, 243; Chem 22, 50, 122, 151–52, 153–54; Geol 5, 105, 125, 128, 141, 163, 272; Phys 14, 15, 16, 127–28.
   (c) 24 semester hours in courses selected from two departments in the following—Anth 151, 152, 171, 186, 187, 188, 263, 267; Econ 101, 102, 157, 158, 161, 199, 237; Geog 106, 107, 108, 110, 127, 134, 135, 136, 137, 140, 142, 143, 145, 222; PSc 104, 111, 112, 117, 118, 120, 122, 187; Psyc 104, 144, 151, 156; Soc 126, 127, 128, 151, 152, 181.
   (d) Envr 151–52, 157.

Bachelor of Science with a major in environmental studies (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses (qualified students may substitute advanced courses, with departmental permission, in order to include more elective courses in their program):
   (a) Statistics—Stat 91.
   (b) Natural sciences—12–18 semester hours selected from BiSc 11–12; Chem 11–12; Geol 1–2; Phys 1, 2, 5, 6. Either BiSc 11–12 or Chem 11–12 must be selected.
   (c) Social sciences—Econ 1–2, plus 6 semester hours selected from Anth 1–2; Geog 1, 2, 3; PSc 1, 2; Psyc 1, 5–6; Soc 1, 2.
3. Required courses for the major (51 semester hours):
   (a) BiSc 140; Econ 136; Geog 132.
   (b) 23 semester hours selected from BiSc 101, 102, 103, 105, 106, 107, 108, 109, 110, 111, 120, 123, 124, 125, 127, 128, 135, 141, 142, 143, 144, 145, 149, 150, 161, 167, 168, 185, 208, 242, 243; Chem 22, 50, 122, 151–52, 153–54; Geol 5, 105, 125, 128, 141, 163, 272; Phys 14, 15, 16, 127–28.
   (c) 9 semester hours selected from Anth 151, 152, 171, 186, 187, 188, 263, 267; Econ

101, 102, 157, 158, 161, 199, 237; Geog 106, 107, 108, 110, 127, 134, 135, 136, 137, 140, 142, 143, 145, 222; PSc 104, 111, 112, 117, 118, 120, 122, 187; Psyc 104, 144, 151, 156; Soc 126, 127, 128, 151, 152, 181.

(d) Envr 151–52, 157.

The science and social science courses listed under 3(b) and 3(c) above must be taken in not more than three departments. Not more than 6 hours of service-learning courses may count toward fulfilling requirements of the major.

In choosing elective courses for both the Bachelor of Arts and Bachelor of Science degree programs, students are reminded that permission of the Dean of Columbian College of Arts and Sciences and the Committee on Environmental Studies is necessary to take courses not offered by Columbian College of Arts and Sciences, and that a maximum of 12 semester hours of such courses may be taken. The following may be of interest to the environmental studies major: BAd 101, 171, 201, 203; *CE 194, 197; HKLS 152; U&RP 153, 201, 205. The permission of the instructor, the department chairman, and the Dean of the School of Government and Business Administration is necessary to take graduate courses (numbered 201 and above) in that School.

151–52 **Senior Seminar in Environmental Studies** (3–3)
Limited to majors in environmental studies. Directed reading and discussion of contemporary environmental problems.

157 **Introduction to Environmental Law** (3)
An introduction to selected pieces of major environmental legislation. The role of the courts and bureaucracy in implementing and interpreting legislation. Impact on decision-making. Designed for students with no training in law.

158 **Special Topics in Environmental Law** (3)
Analysis of environmental laws that focus on a particular environmental issue. Topics will vary. Prerequisite: Envr 157 or permission of instructor.

159–60 **Field Experience** (3–3)
Open to juniors and seniors majoring in environmental studies. Students will spend at least eight hours per week in a political, technical, legal, or special interest organization working on environmental questions.

161 **Environmental Policy Internship** (3 or 6)
A residential program designed for students interested in environmental policy and decision making at the national level. The course consists of an internship with a federal agency or public interest group concerned with environmental affairs, a weekly seminar based on directed readings, guest speaker presentations, and a major term paper. (Summer)

FORENSIC SCIENCES—GRADUATE PROGRAMS

Professors T.P. Perros, J.E. Starrs, T.F. Courtless, Jr., C. O'Rear *(Chairman)*
Adjunct Professor C.G. McWright
Professorial Lecturers B.J. White, C.B. Cunningham, L.R. Goldbaum, E.G. Howe, C.E. Bohn
Associate Professors N.T. Lappas, W.F. Rowe
Associate Professorial Lecturers J.T. Smith, J.L. Melnick, K.E. Melson, J.P. Hume, B.W. Given, J.D. Spencer, W.A. Bayse, M.M. Levy, M.S. Clark, A.R. Josselson, S.R. Lorigo
Assistant Professorial Lecturers M. Stajic, J. Blumenfeld, R.E. Easton, H.J. Volzer

Master of Forensic Sciences—Prerequisite: a bachelor's degree from an accredited institution of higher learning and academic or professional experience in the behavioral, biological, or physical sciences or in law, medicine, or law enforcement.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Students must complete 36 semester hours of approved course work; students approved for a thesis must complete 30 semester hours of course work plus a thesis (equivalent to 6 semester hours). ForS 220, 221, 224, and 225 are required of all students. ForS 224 may be waived for students having an LL.B. or J.D. degree from an accredited

* See the *School of Engineering and Applied Science Bulletin* for civil engineering courses.

law school. The following are also required: (1) 9 hours selected from ForS 201, 202, 203, 204, and 205; (2) 9 hours selected from ForS 214, 260, 261, 265, and 269; (3) the remaining semester hours must be selected in consultation with the advisor from the behavioral sciences, law, management science, or forensic sciences. It is strongly recommended that students participate in the forensic sciences practicum. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement.

Master of Science in the field of chemical toxicology—Prerequisite: completion of the first three years of the combined B.S./M.S. program in chemical toxicology (see Chemistry Department) or its equivalent. Courses may be required to remove academic deficiencies.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The following courses are required: Bioc 221–22; Phyl 191; Phar 203; ForS 240, 245, and 242 or 270; two courses selected from ForS 246, 248, 249, 269; ForS 299–300 or Chem 299–300. Chem 134, 141–42, and Stat 127 will be required of students who have not had these courses or their equivalent. All candidates are required to pass a Master's Comprehensive Examination. There is no tool requirement.

Master of Science in Forensic Science—Prerequisite: a bachelor's degree in the biological or physical sciences from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 30 semester hours of course work, plus a thesis (equivalent to 6 semester hours). Individualized programs of study will be developed to meet the career objectives of each student. Students may specialize in forensic chemistry, toxicology, or serology. Each such program of study must include ForS 224 and 225. All candidates must also participate in the departmental seminar each semester. The remaining semester hours must be selected from approved courses in the forensic sciences, biological and physical sciences, management science, law, or basic medical sciences. It is strongly recommended that students participate in the forensic sciences practicum. All candidates are required to pass a written Master's Comprehensive Examination. Candidates must also fulfill the tool requirement by passing a reading knowledge examination in French, German, or Russian, or by satisfactorily completing the tool requirement in either statistics or computer programming.

Master of Arts in the field of criminal justice—Prerequisite: a bachelor's degree from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 36 semester hours of approved course work in the forensic sciences, law, criminology, management science, sociology, and psychology. ForS 214, 220, 221, 224, 225, 228, 265, 266, 274, 290, and Soc 259, 261 are recommended. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement. It is strongly recommended that students participate in the forensic sciences practicum.

Master of Arts in the field of criminal justice with a concentration in crime in commerce—Prerequisite: a bachelor's degree from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 36 semester hours of approved course work drawing upon the forensic sciences, law, accounting, computer science, investigative techniques, and management. ForS 203, 224, 225, 229, 232, 233, 234, 235, 251, 267, 274, and Stat 197 are recommended. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement. It is strongly recommended that students participate in the forensic sciences practicum.

Master of Arts in the field of criminal justice with a concentration in security management—Prerequisite: a bachelor's degree from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Students must complete 36 semester hours of approved course work; students approved for a thesis must complete 30 semester hours of course work plus a thesis (equivalent to 6 semester hours). The program of study consists of course work drawing

from the forensic sciences, law, criminology, management science, investigative techniques, and security management. Courses are selected from ForS 214, 224, 229, 232, 233, 234, 252, 254, 256, 257, 266, 267, 290, 295; Soc 263. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement. It is strongly recommended that students participate in the security management practicum.

The interdisciplinary programs leading to the degrees of Master of Arts, Master of Forensic Sciences, and Master of Science in Forensic Science may include course work from the School of Government and Business Administration, the National Law Center, the School of Medicine and Health Sciences, and graduate course work in the behavioral, biological, and physical science departments of the University. Students work closely with their advisors in setting up a program that meets their interests, needs, and background knowledge. The Department of Forensic Sciences is affiliated with the Armed Forces Institute of Pathology and with the Council of Higher Education, Commonwealth of Virginia, in programs of mutual exchange of students, courses, and facilities. For further information, contact the Department of Forensic Sciences.

A research field in forensic chemistry is available in the Ph.D. program in the Chemistry Department.

201 **Forensic Serology I** (3) Lappas, Mudd
Principles of the forensic analysis of blood and other biological materials. Specific procedures and techniques used in forensic serology. Laboratory exercises.

202 **Instrumental Analysis** (3) Perros, Rowe
Principles and application of various instrumental methods to the examination of criminal evidence, including chromatographic and spectrophotometric techniques and mass spectrometry. Laboratory exercises.

203 **Examination of Questioned Documents** (3) Bohn
Theory and principles of handwriting and handprinting, duplicating processes, paper manufacture and fiber analysis; studies of paper and methods of examining questioned documents. Laboratory exercises.

204 **Firearms and Tool-mark Identification** (3) Cunningham, Rowe
Methods for identifying firearms, cartridge casings, tool marks, tire marks, and footprints. Laboratory exercises.

205 **Personal Identification** (3) Given
Methods of personal identification based on sketches, fingerprints, voiceprints, odontology, and study of skeletal remains.

214 **Forensic Psychiatry** (3) Howe, Saiger, Smith, Manne
Introduction to the constructs of dynamic psychiatry, psychiatric treatment, and the nomenclature of mental disorders. Consideration of expert testimony, direct examination, and cross-examination in hospitalization and criminal cases.

220 **Physical Aspects of Forensic Sciences** (3) O'Rear, Rowe
Survey of forensic physical sciences; fingerprints, firearm and toolmark examinations, document examinations, and examinations of trace evidence such as glass, soil, paint, hairs, and fibers; crime scene investigations; qualifications and preparation of expert witnesses; operation and functioning of the forensic science laboratory.

221 **Biological Aspects of Forensic Sciences** (3) Lappas, Rowe
Principles of forensic pathology, serology, and toxicology. The role of the forensic laboratory in the identification of human remains; determination of the time, cause, and manner of death; partial individualization of biological materials; and the detection of drugs in biological materials.

224 **Criminal Law I** (3) Hume, Melnick, Melson
Principles of criminal law and procedure, preparation and presentation of evidence, examination of witnesses, and methods of legal research.

225 **Criminal Law II: Evidence** (3) Melson, Melnick, Volzer
Procedural rules affecting the collection and use of physical evidence.

Emphasis on court opinions defining the rules of search and seizure and admissibility of evidence. Prerequisite: ForS 224.

227 **Criminal Law III: Procedure** (3) Starrs, Volzer
Decision to arrest, prosecutive discretion, bail, the preliminary hearing, right to a speedy trial, discovery, plea bargaining, publicity, postconviction procedures. Prerequisite: ForS 224.

228 **Administration of Criminal Justice** (3) Blumenfeld, Starrs
Consideration and analysis of selected advanced problems in the administration of criminal justice. Emphasis on the role and professional responsibilities of prosecutor and defense counsel and on developmental trends in the law. Prerequisite: ForS 224.

229 **Criminal Law IV: Contracts** (3) Easton, Harris
Concepts and principles of law encountered in commercial activities: contracts, sales, negotiable instruments, and bankruptcy. Emphasis on recognition of deceptive contracting practices. Statutes and government regulation governing contracts.

232 **Crime in Commerce I: Accounting** (3) Levy, Lorigo
Principles of accounting; abuse and misuse of accounting procedures; use of accounting in the investigation of commercial crime.

233 **Crime in Commerce II: Procurement and Supply** (3) Levy, Lorigo
Governmental and private-sector procurement procedures; techniques of inventory management; abuse of procurement procedures and illicit diversion of supplies.

234 **Crime in Commerce III: Information Systems** (3) Bayse
Principles of management information systems; security of information systems and facilities; compromising of information systems.

235 **Crime in Commerce IV: Conspiracy** (3) Fortuin, Kotelly
Legal definition of conspiracy; quantum of proof; use of investigative techniques to establish the existence of criminal conspiracies.

240 **Principles of Toxicology** (4) Lappas
Concepts of toxicology, including its historical development and modern applications, drug disposition, mechanisms of toxicity; factors that influence toxicity and toxicity evaluation. Prerequisite: Phar 203 or permission of instructor.

242 **Chemistry of Organic Medicinal Agents** (3) O'Rear
A correlated study of the composition, constitution, physical and chemical properties, and pharmaceutical uses of organic medicinal agents. Included are discussions of the heterocyclic chemistry of these agents.

245 **Analytical Toxicology** (4) Lappas
A study of qualitative and quantitative principles and procedures used in the detection, identification, isolation, purification, and potency determination of drugs. Laboratory.

246 **Environmental Toxicology** (3) Lappas
A study of the chemical substances to which humans are unintentionally exposed. Emphasis will be placed on pesticides, food additives, and air pollutants.

248 **Clinical Toxicology** (3) Staff
A study of the adverse effects caused by or related to the use of drugs. The signs and symptoms, diagnoses, and treatments will be emphasized.

249 **Industrial Toxicology** (3) Staff
A study of the potential hazards encountered by workers as a result of their exposure to raw materials, intermediates, and finished products. The types of exposure and methods of predicting and preventing toxic exposure will be emphasized.

250 **Interdisciplinary Aspects of Forensic Science** (3) Starrs, Volzer
Scientific and legal aspects of current concepts. Includes qualification as an expert witness, chain of custody, impact of testimony on the jury, admissibi

ity of evidence, class evidence vs. individualized evidence, and search and seizure. Prerequisite: ForS 224.

251 **Moot Court** (3) Blumenfeld, Rowe
Students will prepare and present direct testimony and be cross examined by an experienced trial attorney in simulated courtroom setting. Class discussions of problems, techniques. Lectures on discovery, admissibility of scientific evidence, chain of custody, use of notes, etc. Prerequisite: ForS 224.

252 **Topics in Security Management** (3) Staff
The broad spectrum of factors that shape modern security management: technology, government regulations and policies, corporate matters, information systems, legal principles, international programs, congressional committees, industrial organizations, associations. Potential areas of research and study.

254 **Selected Topics in the Forensic Sciences** (3) Staff
Current issues in research, investigation, and law.

255 **Security Management I** (3) Staff
Risk assessment and management, redundant security systems, cost–benefit analysis. Administration of personal, industrial, and physical plant security. Analysis of factors that facilitate decision making in security problems.

256 **Security Management II** (3) Staff
Hostage situations, preparation of high-risk employees and spouses for hostage incidents, management of post-incident situations, hostage rescue groups.

257 **Management of Security Organizations** (3) Staff
Theories of management, with emphasis on leadership and interaction of individuals, groups, managers, and the organization as a whole. Discussions centered on organizations with security responsibilities, including government agencies, corporate entities, and the military.

260 **Principles of Forensic Medicine** (3) Josselson
Anatomy and physiology of the human body with emphasis on understanding the processes underlying traumatic and unexpected deaths encountered in forensic pathology. Bone growth and repair as it relates to child abuse, structure and functions of the heart relating to sudden death, and anatomic area of the brain prone to hemorrhagic lesions following trauma.

261 **Principles of Forensic Pathology** (3) Lord, Spencer
Terminology and scientific techniques used in medico-legal investigations, sudden or unexpected deaths, homicides, suicides, accidental deaths, and trauma.

265 **Drugs of Abuse** (3) Lappas, O'Rear
Chemical, pharmacological, toxicological, and pathological characteristics of commonly abused drugs, including ethanol, barbiturates, narcotics, stimulants, and hallucinogens. Primarily for M.A. degree candidates; open to others with permission of instructor.

266 **Seminar: Modern Trends in Criminal Justice** (3) O'Rear, Courtless
Recent advances in criminal justice. Discussions incorporate several disciplines, including science, law, management, social sciences, and psychology.

267 **Seminar: Crime in Commerce** (3) Levy, Lorigo
Interdisciplinary course in current problems in the investigation and prosecution of commercial offenses.

268 **Photography in the Forensic Sciences** (3) Spencer
Basic use of forensic photography, including selection and use of equipment, photographs as evidence, close-up work, and common misconceptions. Laboratory fee, $35.

269 **Forensic Toxicology I** (3) Lappas, Stajic
Relevant underlying biological, chemical, and pharmacological principles of forensic toxicology.

270 **Medicinal Chemistry** (3) O'Rear
Theory and principles of classification, synthesis, and structure activity

relationships of drugs. Discussion of the complex chemical events that take place between administration of a drug and its action on the user, with emphasis on drugs of abuse.

271 **Forensic Serology II** (3) Lappas, Mudd
Methods in forensic serology. Laboratory examinations and classifications of dried blood and other biological materials. Independent laboratory projects. Laboratory fee, $35. Prerequisite: ForS 201 or permission of instructor.

272 **Forensic Toxicology II** (3) Lappas, Stajic
Lectures, student seminars, laboratory exercises, and projects dealing with topics of current interest in forensic toxicology. Prerequisite: ForS 245 or 269 or permission of instructor. Laboratory fee, $35.

273 **Forensic Chemistry I** (3) Rowe
Examination of glass, soils, hairs, and fibers. Laboratory exercises include refractive index measurements using immersion methods; polarized light observations of minerals, hairs, and fibers; elemental analysis of glass and soil by spectroscopic methods; x-ray diffraction analysis of minerals; and classical chemical and physical methods of analysis. Prerequisite: ForS 202 or permission of instructor. Laboratory fee, $35.

274 **Management of Criminal Justice Organizations** (3) O'Rear
Theories of management with emphasis on leadership. Interaction of individuals, groups, managers, and the organization as a whole. Discussions centered on the criminal justice system.

280 **Forensic Chemistry II** (3) Rowe
Examination of arson accelerants, textile fibers, plastics, and paints. Laboratory exercises include infrared spectrophotometry and pyrolysis—gas–liquid chromatography of polymeric materials, as well as classical chemical and physical methods of analysis. Prerequisite: ForS 273. Laboratory fee, $35.

290 **Research in Criminal Justice** (3) Courtless
An examination of the role and process of research as it serves the criminal justice systems. Presentations and discussions of the literature with emphasis on the use of research and analysis in formulating and evaluating criminal justice policy.

295 **Research** (arr.) Staff
Open to qualified master's degree students. Research on problems approved by the department chairman or academic advisor, under the supervision of an appropriate staff member.

297 **Security Management Practicum** (1)
Open to qualified master's degree students. Internship experience in an agency or corporate unit with security responsibilities, under the supervision of an appropriate staff member. Students must preregister for the course. Credit for the course cannot be used toward the 36 semester hours required for the master's degree. Staff

298 **Forensic Sciences Practicum** (1)
Open to qualified master's degree students. Internship experience in a forensic science laboratory or criminal justice agency, under the supervision of an appropriate staff member. Students must preregister for this course. Credit for the course cannot be used toward the 36 semester hours required for the master's degree. Staff

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

FRENCH

See **Romance Languages and Literatures.**

GENERAL CURRICULUM IN THE LIBERAL ARTS

Bachelor of Arts: General Curriculum in the Liberal Arts (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. *Humanities*—39 semester hours:

(a) 6 semester hours selected from Engl 9 or 10, 11 or 12, 101.

(b) 18 semester hours selected from the following courses (note that 6 of these hours must be in a foreign language at the advanced level, e.g., Fren 51–52 or 91–92, Span 51–52 or 91–92; appropriate advanced courses in other foreign languages may be suggested by the departments concerned): Chin 163–64; Clas 71, 72, 108, 113, Engl 51–52, 61–62, 71–72, 127–28, 153–54, 155–56, 160 in combination with 161 or 162, 163–64, 165–66, 167–68, 170, 191–92; Fren 51–52, 60 in combination with 51 or 52, 91–92; Ger 51–52, 103–4, 111–12, 126, 161–62; Slav 91–92; Span 51–52, 91–92.

(c) 6 semester hours selected from Phil 111, 112, 113.

(d) 3 semester hours selected from Rel 9, 10, 21, 59, 60, 103, 104, 105, 107, 111, 113, 114, 115, 116, 126, 137, 143, 144, 145.

(e) 6 semester hours selected from Art 1, 31–32, 71–72, 101, 102, 103, 104, 105, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 140, 145, 147, 148, 149, 150, 155, 156, 161, 162, 165, 167, 169–70; Mus 3, 4, 7, 101–2, 103–4, 109, 110, 121, 125; CmTr 45, 49, 126, 143, 144, 165–66.

3. *Social Sciences*—18 semester hours:

(a) 6 semester hours selected from Hist 108, 109, 110, 111–12, 121, 122, 123–24, 171–72, 175–76, 179–80, 183.

(b) 6 semester hours selected from courses in economics; or 6 semester hours selected from courses in political science.

(c) 6 semester hours selected from courses in American civilization, anthropology, geography and regional science, psychology, or sociology.

4. *Natural and Mathematical Sciences*—18–22 semester hours:

(a) 6–8 semester hours in each of two laboratory sciences selected from BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; Phys 1, 2, 5, 6; 9–10; or 21, 22.

(b) 6 semester hours selected from courses in mathematics (excluding Math 3 and 6).

5. *Electives*—41 semester hours of courses selected in consultation with the advisors.

A major is optional. If a student chooses a major, elective courses may be used to fulfill the requirements for it.

A student must pass a minimum of 36 semester hours of second-group courses. By passing an examination administered or authorized by the appropriate department, a student may waive introductory courses that are prerequisite to more advanced courses.

GENETICS—GRADUATE PROGRAMS

Committee on Genetics

S.O. Schiff *(Chairman)*, W.F. Anderson, A.M. Attalah, K.M. Brown, D.J. Brusick, R.F. De Giovanni-Donnelly, W. Drohan, E.M. Earley, R.C. Gallo, C.T. Garrett, D. Goldman, G. Hager, C.B. Jacobson, D.E. Johnson, P.D. Kind, K. Krell, A. Kumar, J.W. Larsen, W.M. Leach, R. Mage, C.R. Merril, W.G. Nash, P. Noguchi, S. O'Brien, J.C. Petricciani, U.R. Rapp, K.N. Rosenbaum, B. Safer, J. Schlom, J. Schulman, R.W. Seelke

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degrees of Master of Science and Doctor of Philosophy in the field of genetics. This program is directed by a committee whose members are drawn from the Departments of Anatomy, Biochemistry, Biological Sciences, and Microbiology, and Obstetrics and Gynecology and from government agencies and private industry.

A bachelor's degree and acceptable Graduate Record Examination scores are required for admission to the degree program. The undergraduate program must have included the following: 8 semester hours each in biology, inorganic chemistry, and organic chemistry; 6 semester hours in physics; and 6 semester hours in English composition and literature. Although not required for admission, courses in embryology, genetics, and mathematics are strongly recommended.

Master of Science in the field of genetics—Required: the general requirements stated under the Graduate School of Arts and Sciences. The 30 semester hours required in this program must include Gnet 201 and Gnet 299–300. The remaining 22 semester hours of course work are to be selected, with the approval of the Committee on Genetics, from the

departmental courses listed below. The tool requirement may be met by satisfactorily completing an approved course in biostatistics, computer science, or electron microscopy or by passing a foreign language reading examination.

Doctor of Philosophy in the field of genetics—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study must include Gnet 301, 8–10 semester hours of biochemistry, 6–8 semester hours of cell biology, 10–12 semester hours of genetics, and 3 semester hours of statistics. These courses may be selected from the departmental listings below. The tool requirement may be met by the satisfactory completion of two of the following: an approved course in biostatistics, computer science, or electron microscopy or passing a foreign language reading examination, preferably in French or German.

GENETICS

Third Group

201 **Advanced Problems in Genetics** (2) Staff
Lectures on selected topics by members of the Committee on Genetics. Required of all master's degree candidates in the genetics graduate program. (Fall)

295 **Research** (arr.) Staff
Open to qualified master's degree students. Research on problems approved by the Committee on Genetics. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Academic year)

Fourth Group

301 **Advanced Problems in Genetics** (2) Staff
Lectures on selected topics by members of the Committee on Genetics. Required of all Ph.D. candidates in the genetics graduate program. (Fall)

398 **Adanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ANATOMY

203 *Human Developmental Anatomy* (1)

BIOCHEMISTRY

221–22 *General Biochemistry* (4–4)
229 *Biochemistry of Enzymes* (2)
232 *Protein Chemistry* (2)
250 *Cell and Molecular Biology* (3)
251 *Advanced Topics in Molecular Biology* (1 or 2)
252 *Biochemical and Molecular Aspects of Selected Diseases* (2)
256 *Biochemical Genetics and Inherited Metabolic Diseases* (1 or 2)

BIOLOGICAL SCIENCES

Biology

111 *Introductory Microbiology* (4)
122 *Cell Biology* (3)
123 *Cell Biochemistry* (3)

124 *Cell Biochemistry Laboratory* (2)
127 *Genetics* (3)
128 *Genetics Laboratory* (1)
138 *Advanced Genetics* (3)
167 *Radiation Biology* (3)
220 *Seminar: Cell or Plant Biochemistry* (3)
227 *Seminar: Genetics* (3)
228 *Population Genetics* (3)
229 *Cytogenetics* (3)
230 *Human Genetics* (3)
248 *Analysis of Development* (3)
249 *Seminar: Developmental Biology* (3)
272 *Electron Microscopy* (3)
273 *DNA Replication* (3)
274 *Gene Regulation and Genetic Engineering* (3)

Zoology

145 *Introduction to Vertebrate Embryology* (4)
146 *Experimental Developmental Biology* (4)
212 *Seminar in Comparative Reproductive Biology* (3)

MICROBIOLOGY

211 *Microbiology* (3)
214 *Tissue Cell Culture* (3)
219 *Scientific Writing* (1)
229 *Immunology* (3)
230 *Immunology Laboratory* (2)
231 *Immunobiology* (1)
233 *Virology* (3)
234 *Virology Laboratory* (2)
258 *Microbial Genetics* (2)
260 *Cellular Immunology* (1)

PHARMACOLOGY

203 *Fundamental Principles of Pharmacology* (3)
222 *Genetic Toxicology* (2)
258 *Cancer Chemotherapy* (1)

STATISTICS

91 *Principles of Statistical Methods* (3)
127 *Statistics for the Biological Sciences* (3)
129 *Introduction to Computing* (3)

GEOBIOLOGY—GRADUATE PROGRAMS

Committee on Geobiology
A.G. Coates (*Chairman*), M.A. Buzas, R.E. Knowlton, D.L. Lipscomb, H. Merchant, A. Viterito

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degrees of Master of Science and Doctor of Philosophy in the field of geobiology. The program is directed by a committee whose members are drawn from the Departments of Biological Sciences, Geography and Regional Science, and Geology. It is enhanced by cooperative relationships with the Smithsonian Institution and U.S. Geological Survey.

A bachelor's degree in biology, botany, geology, or zoology from this University, or an equivalent degree from another accredited institution of higher learning, is required for

admission to the program. Prerequisite University courses (or equivalent courses elsewhere) include the following: BiSc 101 or 104, 108, 127, 140; Geol 2, 151 or 154, 166; Stat 91.

Master of Science in the field of geobiology—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program includes 30 semester hours of course work, plus a thesis (equivalent to 6 semester hours). Required courses include BiSc 107 or 168 or 169, 208, 209; Geol 195, 254, and 255. Electives are selected from the following (to total, with the required courses, at least 30 semester hours): BiSc 102, 103, 104, 105, 106, 110, 138, 141, 143, 144, 162, 168, 169, 204, 207, 210, 211, 221, 227, 228, 229, 242, 243; Geog 104, 106, 108, 219, 220; Geol 105, 125, 128, 152, 154, 158, 163, 175, 181, 241, 253, 258, 263, 266.

Doctor of Philosophy in the field of geobiology—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program includes 48 semester hours of course work, plus a dissertation (equivalent to 24 semester hours). Required courses include: BiSc 107, 208, 209, 211, 228; Geol 125, 195, 254, 255, 263. Electives are to be selected from remaining elective courses listed for the master's degree (to total, with the required courses, at least 48 semester hours).

Research fields: botany, climatology, ecology, evolution, genetics, geomorphology, hydrology, micropaleontology, paleoecology, paleontology, sedimentary geology, stratigraphy, zoology.

GEOGRAPHY AND REGIONAL SCIENCE

Professors M. Gordon, J.C. Lowe *(Chairman)*
Professorial Lecturers E. Marasciulo, J. Pickard, G.J. Demko
Associate Professor E.O. Pederson
Associate Professorial Lecturers J.A. Zinn, J. Banister, D.C. Dahmann, S.E.S. Mastran, R.C. Malhotra
Assistant Professor A. Viterito
Assistant Professorial Lecturer D.S. Kamerling, S. Grzeda

Bachelor of Arts with a major in geography (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required courses in the major—Geog 1, 2; 30 semester hours of second-group geography and regional science courses to be chosen in consultation and with the approval of the undergraduate advisor. One course must be chosen from each of the following: Group A—Geog 108, 110, 132, 136; Group B—Geog 125, 126, 140, 141; Group C—Geog 127, 133, 145, 146; Group D—Geog 104, 105, 106, 107.

Minor in geography—Required: one course from each of the following groups: Group A—Geog 127, 145, 146; Group B—Geog 125, 126, 141; Group C—Geog 108, 110, 137; Group D—Geog 132, 134, 135, 136; Group E—Geog 124, 140, 143.

Master of Arts in the field of geography—Prerequisite: a Bachelor of Arts degree with a major in geography from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The minimum requirement consists of 30 semester hours of approved course work including a thesis; with the approval of the department, a student may elect a program of study without a thesis but must then complete 36 hours of approved course work. A Master's Comprehensive Examination is required. Candidates must fulfill the tool requirement in one of three ways: (1) passing a reading knowledge examination in an approved foreign language; (2) satisfactorily completing 3 semester hours in statistics selected from Stat 105, 118, 119, 187, 188, 193; or (3) satisfactorily completing one of the following courses: Stat 129, 130, 131.

Master of Science and *Doctor of Philosophy in the field of geobiology*, see Geobiology.

Associate in Science in Cartography—The following requirements must be fulfilled:
1. The general requirement in English stated under the Division of Continuing Education and Summer Sessions.
2. Prerequisite: Cart 1 and 2.
3. Required courses in related areas: Geog 2, 107; Math 31, 32; Stat 129, 130.
4. Required courses in the major: Cart 17, 113, 126, 128.

Bachelor of Science in Cartography—The following requirements must be fulfilled:
1. The general requirements stated under the Division of Continuing Education and Summer Sessions.
2. Prerequisite: Cart 1 and 2.
3. Required courses in related areas: Math 31, 32; Geog 2, 106, 107, 108; Stat 129, 130.
4. Required courses in the major: 1) two courses chosen from Cart 17, 18, 131; 2) five courses chosen from Cart 108, 110, 113, 120, 121, 126, 128.
5. Electives selected in consultation with the advisor.

Bachelor of Arts in Education and Human Development with a teaching field in Geography—Prerequisite: the education curriculum; required: the geography option and the professional courses stated under the School of Education and Human Development.

GEOGRAPHY AND REGIONAL SCIENCE

First Group

1–2 **Introduction to Geography** (3–3) Staff
A systematic survey of human and environmental geography. Geog 1: cultural perspectives on the use of space; Geog 2: perspectives on the environment and human ecology. (Geog 1—fall and spring; Geog 2—spring)

3 **The Physical Environment** (3) Viterito
A study of the earth's physical environment, its systems, subsystems, and physical processes. Laboratory fee, $25.

91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course offered by the Departments of East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Political Science, and Religion. A comprehensive and integrated introduction to the civilization and present problems of East Asia. (Spring)

Second Group

104 **Maps and Mapmaking** (3) Staff
Descriptive and statistical techniques for thematic mapping; computer cartography. Laboratory fee, $25.

105 **Techniques of Spatial Analysis** (3) Viterito
Nature of geographical inquiry, approaches to the study of geography, empirical research methods. (Spring)

106 **Remote Sensing of the Environment** (3) Viterito
Examination of the principles and applications of remote sensing techniques using color infrared, microwave, and satellite imagery. Laboratory fee, $25.

107 **Air Photo Interpretation** (3) Staff
Use of aerial photography for problems in land use, urban analysis, archaeology, and environmental monitoring. Laboratory fee, $25. (Fall)

108 **Weather and Climate** (3) Viterito
An examination of atmospheric processes and climatic regions. Laboratory fee, $25. (Spring)

110 **Climate and Human Ecology** (3) Viterito
Effects of climate on human activities. Examination of human-induced climate change.

115 **Field Program in Mesoamerican Archaeology and History** (6) Humphrey, Mergen
Same as AmCv/Anth 115.

120 **Geographic Information Systems** (3) Staff
Analysis of cartographic data structures and automated mapping data bases.

Examination of digitizing and plotting techniques. Laboratory fee, $25. (Fall)

121 **Computer Mapping** (3) Staff
Analysis and application of computer mapping methods. Examination of FORTRAN and BASIC programming methods as they apply to cartography. Laboratory fee, $25. (Spring)

124 **Urban Transportation** (3) Lowe
The relationship between freight and passenger transportation systems and urban land use patterns and structure.

125 **Transportation and Communication** (3) Lowe
The structure and evolution of transportation and communication networks and their impact on regional development. (Spring)

126 **Location in Manufacturing and Agriculture** (3) Pederson
Theories dealing with the location and dynamics of economic activities. (Spring)

127 **Population and Settlement** (3) Gordon
Patterns of world population; factors contributing to population pressures, growth, and migrations. (Spring)

132 **Resource Management and Conservation** (3) Staff
Principles and practices in effective utilization of resources in the United States and selected areas; public policies relating to conservation; environmental systems, perception, and impact studies. (Fall)

133 **People, Land, and Food** (3) Gordon
Spatial disparities in world food production, demand, and distribution; regional food-population balances; food supply problems and prospects.

134 **Energy Resources** (3) Staff
Analysis of regional patterns and trends in consumption and production of energy resources. Examination of international energy linkages and energy policies of selected nations. (Spring)

135 **Resources and Environmental Quality** (3) Staff
Investigations into questions of resource use and environmental quality. Emphasis on public policy and societal attitudes as they influence man's use of resources. (Spring)

136 **Water Resources** (3) Viterito
Analysis of the spatial patterns, development, and use of water resources.

137 **Environmental Hazards** (3) Viterito
Examination of natural hazards in terms of their types, distributions, and impacts on human activities.

140 **Spatial Perspectives on the City** (3) Pederson
Analysis of the internal spatial structure of cities; emphasis on explaining patterns and dynamics of location within the city. (Fall)

141 **Urban Settlement** (3) Pederson
The location of cities, urbanization processes, theories and models of urban location and development. (Spring)

143 **Spatial Behavior** (3) Lowe
Behavioral perspectives on human spatial activities in cities.

145 **The Cultural Landscape** (3) Staff
Analysis of the relationships between culture and environment; emphasis on spatial and ecological considerations. (Fall)

146 **Place, Space, and Politics** (3) Staff
Interrelationships among the human and physical environment and political systems; the organization of political territories. (Fall)

147 **Military Geography** (3) Gordon
An examination of environmental and locational factors and their impact on military planning and operations. (Spring)

151 **Man and Land in North America** (3) Pederson
An examination of the social, environmental, and economic factors that have led to development of the several regions of the U.S. and Canada. (Fall)

154 **Man and Land in the Middle East and North Africa** (3) Gordon
Cultural and physical regional patterns of the Middle East and North Africa. (Fall)

161 **Man and Land in Latin America** (3) Gordon
Examination of spatial characteristics of physical and cultural phenomena in Middle and South America. (Fall)

189–90 **Readings in Geography** (arr.) Staff
(Academic year)

198 **Special Topics** (3) Staff
Consideration of geographic aspects of topical and future problems of society. May be repeated for credit provided that the topic differs.

199 **Internship** (3) Staff
Field work, internship or other controlled assignment with an agency or organization engaged in work in applied geography.

Third Group

219 **Seminar: Climatology** (3) Viterito
Atmospheric circulation systems, controls, and distribution. Elements of synoptic climatology, including climate modeling. (Spring)

220 **Seminar: Climatic Change** (3) Viterito
Climatic history: examination of natural and induced climatic change.

222 **Seminar: Resources and the Environment** (3) Staff
Analysis of the spatial variations and interrelationships of resources and the environment. (Spring)

223 **Seminar: The Population–Food Balance** (3) Gordon
Spatial problems associated with the dynamics and interaction of population growth and agricultural output.

224 **Seminar: Political Geography** (3) Pederson
Examination of the political factor in location theory and analysis of the nature of political territories.

225 **Seminar: Transportation Geography** (3) Lowe
Transportation and communication in the organization of space.

230 **Seminar: Spatial Implications of Resource and Environmental Policy** (3) Staff
A consideration of the differential regional implications of and responses to resource and environmental policy decisions due to regional differences in societal and physical parameters.

243 **Seminar: Urban Geography** (3) Lowe
Evolving morphology and internal spatial patterns of cities. (Fall)

244 **Seminar: Urban Systems** (3) Pederson
Central place theory and other theories of urban location and the organization of systems of cities. (Fall)

250 **Regional Development** (3) Gordon
Geographic perspectives on the policy, planning, and programmatic aspects of regional development. (Spring)

261 **Latin American Geopolitical Trends** (3) Marasciulo
(Formerly Seminar: Geography of Latin America)
Political and economic factors in a development context; emphasis on natural and human resources and environmental and land use issues. (Fall)

265 **Seminar: Geography of the Soviet Union** (3) Kamerling
Survey of U.S.S.R. regions and major topical themes of Soviet geography, including population, energy, agriculture, transportation, and regional development. (Spring)

266 **Seminar: Geographic Perspectives on Contemporary China** (3) Banister
China's development prospects: environmental constraints, population growth, and regional differences in context of Chinese cultural patterns and political organization. (Fall)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Same as Anth/Econ/Hist/Span 287 and PSc 285. Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

290 **Principles of Demography** (3) Boulier
Same as Econ 290.

291 **Methods of Demographic Analysis** (3) Boulier
Same as Econ 291.

295 **Research** (arr.) Staff
May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

CARTOGRAPHY*

1 **Cartography I**
Introduction to the fundamental concepts and practical applications of cartography.

2 **Cartography II**
Aerial photography, modern topographic and hydrographic mapping and charting, thematic maps, map reliability, planning and design, and reproduction. Prerequisite: Cart 1.

11 **Navigation**
(Formerly Ocea 11)
Theory of navigation, charts, navigation aids, celestial navigation, shipboard instruments.

17 **Elementary Photogrammetry**
(Formerly Geod 17)
Fundamentals of aerial photography, photogrammetric optics, and photographic processes; mathematics of vertical and tilted photographs; stereoscopy and parallax; planning and executing the photogrammetric project; radial triangulation methods; photomaps; oblique and terrestial photography. Prerequisite: Math 31.

18 **Intermediate Photogrammetry**
(Formerly Geod 18)
Basic theory and practices. Stereoscopic plotting instruments; graphical and computational methods for adjusting strips of aerotriangulation. Method of least squares, statistics, and transformations applied to photogrammetry. Prerequisite: Cart 17.

103 **General Oceanography I**
(Formerly Ocea 103)
General circulation of the oceans; waves, tides, and properties of sea water; history and methods.

104 **General Oceanography II**
(Formerly Ocea 104)
Topography and sediments of the ocean floor; life in the sea; interrelationships of the marine sciences.

110 **Map Projections**
(Formerly Geod 110)
Elementary theory of projections in cartography. Projections of the sphere and ellipsoid on plane, conical, and cylindrical surfaces. Prerequisite: Cart 1, Math 33.

112 **Introduction to Cartographic Management**
An examination of the managerial aspects of the cartographic production cycle. Analysis to include data collections, processing, editing, and project scheduling. Prerequisite: Cart 1.

* Courses are offered off campus only.

113 **Map Design**
Principles of human perception and visual communication as applied to map layout and symbolization. Prerequisite: Cart 1.

120 **Geographic Information Systems**
(Formerly Computer Mapping I)
Examination of the establishment, maintenance, and application of computerized geographic data bases. Prerequisite: Cart 1, Stat 129.

121 **Computer Mapping** (3)
The analysis and application of computer mapping methods; techniques for the automation of data bases and the creation of computer-generated map output. Prerequisite: Cart 1, Stat 129.

124 **Special Topics in Cartography** (3)
Problem areas of current interest in the cartographic sciences. May be repeated for credit provided the topic differs. Prerequisite: Cart 1.

126 **Topographic Mapping** (3)
Application of control surveys and photogrammetry to topographic mapping. Prerequisite: Cart 1.

128 **Thematic Mapping** (3)
Examination of various techniques used in presentations of qualitative and quantitative data. Prerequisite: Cart 1.

131 **Techniques in Remote Sensing** (3)
The application of remote sensing to earth resource studies with emphasis on the physical characteristics of electromagnetic radiation, multispectral sensing, and photographic and digital image analysis. Prerequisite: Geog 106, Math 31.

150 **Introduction to Geodesy** (3)
(Formerly Geod 150, Geometric Geodesy)
Principles and formulae basic to theoretical and applied geodesy. Primary emphasis on geometric methods. Prerequisite: Math 33.

GEOLOGY

Professors F.R. Siegel *(Chairman)*, A.G. Coates, R.C. Lindholm, J.F. Lewis
Adjunct Professors J.W. Pierce, M.A. Buzas, W. Back
Professorial Lecturers N. Hotton, D. Appleman, C.B. Cecil
Associate Professor G.C. Stephens
Associate Professorial Lecturers A. Geiger, M.D. Turner, J. Mercer, T.O. Wright, J.C. Wynn, L.E. Johnson, J.F. Sutter
Assistant Professor R.P. Tollo
Assistant Professorial Lecturers F.J. Collier, R.W. Stanton, L.E. Edwards, R.C. Haney
Lecturer R.T. Rye

Bachelor of Arts or Bachelor of Science with a major in geology (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required introductory course—Geol 1–2.
3. Required courses in related areas—(a) Chem 11–12; (b) Math 30 (for the degree of Bachelor of Arts) or Math 30 and 31 (for the degree of Bachelor of Science); (c) Stat 91; and (d) BiSc 11 or 12 or Phys 1 (for the Bachelor of Arts) or BiSc 11 or 12 and Phys 1 (for the Bachelor of Science).
4. Required courses in the major—Geol 111, 112, 117, 118, 122, 151–52 for both the degrees of Bachelor of Arts and Bachelor of Science; Geol 166, 189, 195 for the Bachelor of Science degree only.

Bachelor of Science with a major in geology—engineering option (engineering geology) (departmental)—An interdisciplinary curriculum offered by the Geology Department and the Civil, Mechanical, and Environmental Engineering Department in the School of Engineering and Applied Science. (Students wishing to work toward the degree of Bachelor of Science [Civil Engineering] with a geology option [geotechnical engineering]

should consult the *School of Engineering and Applied Science Bulletin.*) The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required introductory courses—ApSc 57, 58; Chem 13; EE 51; Geol 1–2; Math 31, 32, 33; Phys 14, 15, 16; or equivalents.
3. Required courses in the major– CE 120, 140, 166, 167, 168, 182, 185; Geol 111–12, 117, 118, 122, 175, 189, 195, and one course chosen from Geol 128, 141, or 163 and Math 111, 112; ME 126, 131; Stat 91 or 102 or ApSc 115.

Minor in geology—18 semester hours selected with approval of the departmental advisor to undergraduates, including 6 hours of introductory geology (Geol 1–2; 5 and 105), two courses selected from Geol 111, 122, 151; and two from Geol 125, 128, 154, or from requirements of the B.A. and B.S. (For students with special interdisciplinary interests, substitutions can be arranged.)

Master of Science in the field of geology—Prerequisite: the degree of Bachelor of Arts or Bachelor of Science with a major in geology from this University, or an equivalent degree, and scores on the Graduate Record Examination.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Master of Science degree candidates must include in their program of study Geol 141, 163, 205, and 272. Geol 299–300 Thesis Research is required. Geol 105, 111, 122, 124, 132, 136, 151, and 152 may not be taken for graduate credit. Candidates must pass a Master's Comprehensive Examination before submitting their thesis work. A reading knowledge examination in an approved foreign language must be passed. With the permission of the department, candidates in the Master of Science program may substitute another approved tool subject in lieu of the foreign language requirement.

Master of Arts in the field of geology—a 33-hour non-thesis option. Prerequisite: the degree of Bachelor of Arts or Bachelor of Science with a major in geology from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Master of Arts degree candidates must take Geol 128, 141, 163, 175, 189, 205, 219, 266, 272, and 295; two electives must be taken from Geol 216 or 263, 220 or 224, 241 or 243, and 253 or 255. Geol 105, 111, 122, 124, 132, 136, 151, and 152 may not be taken for graduate credit. Candidates must pass a Master's Comprehensive Examination. A reading knowledge examination in an approved foreign language must be passed. With permission of the department, candidates may substitute another approved tool subject in lieu of the foreign language requirement.

Master of Science in the field of geochemistry (an interdepartmental degree offered by the Departments of Geology and Chemistry)—Prerequisite: a bachelor's degree with a major in geology or in chemistry from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including Chem 111–12; Geol 141, 241 or 243, 249; Chem 213; and Geol 299–300. Geol 105, 111, 122, 124, 132, 136, 151, and 152 may not be taken for graduate credit. The Master's Comprehensive Examination must be taken before registration for the second half of the thesis work. A reading knowledge examination in a foreign language, approved by the Departments of Geology or Chemistry, must be passed. With permission of the advisor, candidates may substitute another approved tool subject in lieu of the foreign language requirement.

Master of Science in the field of engineering geology—An interdisciplinary degree offered by the Geology Department and the Civil, Mechanical, and Environmental Engineering Department in the School of Engineering and Applied Science.

Prerequisite: a Bachelor of Science degree in geology or a Bachelor of Science (Civil Engineering) degree from this University or an equivalent degree, which must include those courses or their equivalents as outlined for the undergraduate requirements in the field of geology with the engineering option (engineering geology). With the permission of the department, a student may elect a program of study consisting of 36 semester hours of approved course work without a thesis. (Students wishing to work toward a Master of Science in the field of geotechnics and foundation engineering should consult the *School*

of Engineering and Applied Science Bulletin.) Each program is arranged to fit the student's needs and interests. Either hydrogeology or engineering geology may be chosen as the field of specialization.

Required: (a) The general requirements stated under the Graduate School of Arts and Sciences; (b) geology—at least 12 semester hours to include Geol 128, 141, 163, and 205; (c) engineering and physical science—at least 12 semester hours, which may include up to 9 semester hours of approved undergraduate civil engineering courses (12 for non-thesis candidates), the remainder to be selected from ApSc 211, 213; CE 204, 205, 206, 207, 208, 209, 214, 216, 219, 255, 256, 257, 265, 271; ME 221, 227, 231, 261, 262; EngS 212, 213, 214, 218, 221, 228, 230, 231, 233, 236. Geol 105, 111, 122, 124, 132, 136, 151, and 152 may not be taken for graduate credit. The tool subject requirement is the same as for the Master of Science in the field of geology above.

Master of Science and Doctor of Philosophy in the field of geobiology—see Geobiology.

Doctor of Philosophy in the field of geology—Required: the general requirements stated under the Graduate School of Arts and Sciences, including passing a reading knowledge examination in an approved foreign language and one other approved tool subject, and the satisfactory completion of the General Examination in three fields, one of which must be in petrology, stratigraphy, or structural geology.

Research fields: geomorphology, marine geology, mineralogy, paleontology, petrology, sedimentology, stratigraphy, structural geology, geochemistry, and hydrogeology.

Doctor of Philosophy in the field of geochemistry (an interdepartmental degree offered by the Geology and Chemistry Departments)—Required: the general requirements stated under the Graduate School of Arts and Sciences, including passing a reading knowledge examination in an approved foreign language plus the satisfactory completion of Stat 117 and 118, or 91, and the satisfactory completion of the General Examination in four fields, including geochemistry and chemistry.

Bachelor of Arts in Education and Human Development with a teaching field in earth science—Prerequisite: the education curriculum; required: the earth science option and the professional courses stated under the School of Education and Human Development.

First Group

1–2 **Introductory Physical and Historical Geology** (3–3) Stephens, Coates, Tollo, Lindholm, Lewis
An introduction to the principle features of the composition, structure, and history of the earth. Topics include nature of minerals and rocks, physical processes, energy resources, plate tectonics, origin of life, and evolution. Lecture (3 hours), laboratory (2 hours). Laboratory fee, $25 per semester. (Academic year)

5 **Environmental Geology** (3) Siegel, Lindholm
The relation of people and society to natural environments; population evolution, natural hazards, and mineral resources; economic, legal, and political aspects. Laboratory fee, $20. (Fall and spring)

Second Group

105 **Geological Hazards in Land-Use Planning** (3) Siegel
An analysis of geological hazards and related factors that affect land-use planning. Field trip. Prerequisite: Geol 1 or 5, or permission of instructor. Laboratory fee, $15. (Spring)

111 **Mineralogy** (4) Tollo
Lecture and laboratory. Morphological crystallography and systematic mineralogy. Prerequisite: Geol 1; Chem 11 (may be taken concurrently); or permission of instructor. Laboratory fee, $22. (Fall)

112 **Optical Mineralogy** (4) Tollo
Basic light theory, optical characterization of minerals, thin section analysis. Prerequisite: Geol 111. Laboratory fee, $26. (Spring)

113 **Crystallography** (3) Appleman
Point-group and space-group theory, fundamentals of crystal structure, x-ray diffraction theory and application. Prerequisite: Math 31. Laboratory fee, $15. (Alternate academic years)

117 **Petrology** (2) Lewis
Introduction to silicate phase systems; physics and chemistry of crustal and magmatic processes; volcanic processes and products. Prerequisite: Geol 1, 111, 112; Phys 1 or equivalent; or permission of instructor. (Fall)

118 **Petrology Laboratory** (2) Lewis
Concurrent registration in Geol 117 required for geology majors. Prerequisite: Geol 111. Laboratory fee, $26. (Fall)

122 **Structural Geology** (4) Stephens
Study of natural and experimental rock deformation and the relationships between stress and strain as recorded by geologic structures. Prerequisite: Geol 1–2. Laboratory fee, $10. (Fall)

124 **Geologic Map Interpretation** (2) Stephens
Interpretation and analysis of geologic maps and cross sections. Prerequisite: Geol 122. Laboratory fee, $5. (Spring)

125 **Marine Geology** (3) Pierce
Lecture and map work. Principles of oceanography and submarine geology; topography, crustal structure, sedimentary processes, and marine environment. Prerequisite: Geol 1 or permission of instructor. (Spring)

128 **Geomorphology** (3) Staff
Lecture (2 hours), laboratory as arranged. Nature and evolution of earth forms; principles of photointerpretation. Prerequisite: Geol 1. Laboratory fee, $10. (Spring)

132 **Economic Geology** (3) Turner
Genesis and distribution of mineral raw materials and their uses. Prerequisite: Geol 111. (Fall, alternate academic years)

136 **Introduction to Engineering Geology** (3) Geiger, Lewis
For students in the School of Engineering and Applied Science. Geological principles and processes and their application to civil and mechanical engineering. Prerequisite: Phys 2 or equivalent, or permission of instructor. Laboratory fee, $20. (Fall and spring)

141 **Introductory Geochemistry** (3) Siegel
Principles and theories on the abundance, relationships, and distribution of the elements in various rock and mineral species. Prerequisite or concurrent registration: Geol 117 or equivalent: Chem 11–12; Math 31; Phys 1 or 3; or permission of instructor. Laboratory fee, $15. (Fall)

151–52 **Invertebrate Paleontology** (3–3) Coates
Biology, taxonomy, functional morphology, and evolutionary patterns of the invertebrate fossil groups, with emphasis on the macroinvertebrates. Prerequisite: Geol 1–2 or permission of instructor. Laboratory fee, $20 per semester. (Academic year)

154 **Vertebrate Paleontology** (3) Hotton
Lecture (2 hours), laboratory or field work as arranged. General features of vertebrate morphology and evolution; problems of paleoecology and adaptation. (Fall, odd years)

158 **Micropaleontology** (3) Staff
Biology, morphology, paleoecology, biogeography, and biostratigraphy of marine and non-marine phosphatic, organic, siliceous, and calcareous microfossils. (Fall, even years)

163 **Sedimentology** (4) Lindholm
Lecture and laboratory, field trips as arranged. Principles of sedimentology, analysis and interpretation of sedimentary processes and environments. Prerequisite: Geol 112; Stat 91; or permission of instructor. Laboratory fee, $22. (Spring)

166 **Principles of Stratigraphy** (3) Coates
Fundamentals of stratigraphic principles and practice. Review of historical concepts, section measuring, vertical and lateral lithostratigraphic relationships, magnetic and climatic stratigraphy, biostratigraphic classification, zonation, correlation, geochronology, facies, and stratigraphic maps. Prerequisite: Geol 151–52 or permission of instructor. (Fall)

168 **Geology of Coal** (3) Stanton, Cecil
Geologic setting, petrography, and physical/chemical characteristics of coal. Prerequisite: Geol 117, 118, and 163. Laboratory fee, $20. (Spring, alternate years)

175 **Hydrogeology** (3) Back
The occurrence, storage, movement, quality, and problems of pollution of subsurface water and the hydrologic properties of water-bearing materials. Prerequisite: Geol 111, 122; Math 31; Chem 11–12; or permission of instructor. Laboratory fee (field trips), $8. (Spring)

189 **Geophysics for Geologists** (3) Stephens
Basic geophysics to assist the geologist mapping and solving geologic problems. Prerequisite: Geol 1–2; Math 31; Phys 1; or permission of instructor. (Spring)

195 **Field Work** (3) Tollo, Stephens
(Formerly 2 credits)
Weekend field trips. Surveying, geological mapping, and specific field work methods. Students will be responsible for room and board expenses while at field camp (one week). Prerequisite: Geol 122. Laboratory fee (field trip fee), $20. (Spring)

199 **Undergraduate Research or Reading** (arr.) Staff
Problems approved by the staff. May be repeated once for credit. (Fall and spring)

Third Group

205 **Seminar in Geology** (1) Staff
Special topics each semester. May be repeated for credit.

216 **Sedimentary Petrography** (3) Lindholm
Identification, classification, and interpretation of common sedimentary rocks by means of the petrographic microscope. Prerequisite: Geol 112, 163; or permission of instructor. Laboratory fee, $25. (Fall)

219 **Petrogenesis I** (3) Lewis
The origin of selected igneous and metamorphic rock types. Laboratory fee, $22. (Fall)

220 **Petrogenesis II** (3) Lewis
Laboratory fee, $22. (Spring)

224 **Advanced Structural Geology** (3) Lewis
Rock deformation. Methods of study and the formation of structurally complex rock. Tectonics. Prerequisite: Geol 122 or permission of instructor. (Fall, odd years)

241 **Marine Geochemistry** (3) Siegel
Chemical composition and physical properties of sea water, chemical composition and alterations of marine sediments, thermodynamics and biochemical activity in oceans. Methods of analysis and problems of measuring. Prerequisite: Geol 141, Math 31, or permission of instructor. Recommended: Chem 22. Laboratory fee, $20. (Spring, even years)

243 **Geochemical Prospecting** (3) Siegel
Application of geochemical principles and analyses to the detection of hidden ore deposits. Field trips as arranged. Prerequisite: Geol 141. Laboratory fee, $20. (Spring, odd years)

249 **Seminar: Geochemistry** (2) Staff
Independent topics each semester; may be repeated for credit.

253 **Applied Paleontology** (3) Coates and Staff
Fundamentals of paleoecology, using case histories from a wide variety of fossil invertebrate and vertebrate groups. Includes functional morphology of the individual organism and analysis of paleopopulations, paleocommunities, and paleobiogeographic provinces and realms. Relationship of faunal and floral paleobiogeographic units to plate tectonics and uses of different fossil groups in tectonics, paleoclimatology, paleobathymetry, paleochronology, and related topics will be discussed. (Fall, odd years)

254 **Evolutionary Paleobiology** (3) Coates
Consideration of modern evolutionary theory with emphasis on the fossil record. (Fall, even years)

255 **Quantitative Paleoecology** (3) Buzas
Characteristics of populations applicable to the fossil record. Subject matter includes ecosystem concept, habitat, Hutchinsonian niche, life–death, size–frequency distributions, competitive exclusion principle, spatial distributions, relative abundance and diversity, quantification of community biofacies. Prerequisite: Geol 151–52, Stat 91; or permission of instructor. (Fall, odd years)

258 **Seminar: Micropaleontology** (3) Staff
Prerequisite: Geol 158 or permission of instructor. May be repeated for credit. (Fall, odd years)

263 **Sedimentary Environments** (3) Lindholm
Study of selected depositional environments. Field trips as arranged. Prerequisite: Geol 163; Stat 91. Laboratory fee (field trips), $20. (Fall, even years)

266 **Advanced Stratigraphy** (3) Coates and Staff
Analysis of special topics in stratigraphy. Historical background, concept of facies, cycles of sedimentation, clastic and carbonate subsurface lithofacies, subsurface biostratigraphy, ecological and evolutionary attributes of stratigraphically useful organisms, quantitative methods, isochronology, geochronology, and magnetic stratigraphy. Prerequisite: Geol 166 or equivalent. (Spring, even years)

272 **Regional Geology of North America** (3) Tollo
Petrology, stratigraphy, and structure of various physiographic and tectonic provinces. (Fall)

275 **Geochemistry of Groundwater** (3) Back
Application of geochemical principles to the interpretation and prediction of groundwater activity in regional systems; carbonate and silicate equilibrium; weathering and redox reactions; isotopes; and contaminated aquifers. Prerequisite: Geol 175, 141 (may be taken concurrently), or permission of instructor. (Fall—alternate years)

276 **Advanced Groundwater: Modeling** (3) Mercer
Review of basic theory of aquifer systems, analysis of aquifer testing, and numerical methods applied to groundwater problems. Prerequisite: Geol 175 or permission of instructor. A knowledge of FORTRAN is desirable. (Spring—alternate years)

295 **Research** (arr.) Staff
Research on problems approved by the staff. Open to qualified students with advanced training. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

GERMANIC LANGUAGES AND LITERATURES

Professors J.C. King *(Chairman)*, K. Thoenelt, C. Steiner
Associate Professorial Lecturer P. Werres
Assistant Professorial Lecturer G.A. Koskella
Lecturer E.-M.B. Ruhl

Bachelor of Arts with a major in Germanic languages and literatures (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Ger 1–2, 3–4, 9–10, 51–52, or equivalent.
3. Required courses in other areas—6 semester hours in one of the following subjects: art history, music history, or philosophy.
4. Requirements for the major—a minimum of 24 semester hours in German courses above the first group, including Ger 179–80; reasonable proficiency in speaking, reading, and writing German.

Minor in German—Required: 12 semester hours of second-group courses, including Ger 179–80 and one two-semester course in German literature taught in German. Prerequisite: Ger 1–2, 3–4, 9–10, 51–52, or equivalent.

Bachelor of Arts in Education and Human Development with a teaching field in German—Prerequisite: the education curriculum; required: the German option and the professional courses stated under the School of Education and Human Development.

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

GERMAN

First Group

1–2 **First-Year German** (3–3) Staff
Fundamental concepts of German culture; essentials of German structure and basic vocabulary; reading of easy prose and conversation. Aural and oral practice in language laboratory. Laboratory fee, $30 per semester. Prerequisite to Ger 2: Ger 1. (Fall and spring)

*3–4 **Second-Year German** (3–3) Staff
Introduction to German civilization; selections from modern German prose; continuation and review of German structure; conversation and simple composition. Aural and oral practice in language laboratory. Laboratory fee, $30 per semester. Prerequisite to Ger 3: Ger 1–2 or equivalent. Prerequisite to Ger 4: Ger 3. (Fall and spring)

*9–10 **German Conversation and Composition** (3–3) Steiner
(Academic year)

47 **Beginning German for Reading Acquisition** (3) Staff
For undergraduates and graduate students with little or no German who are interested in acquiring a reading knowledge of German. No academic credit for graduate students. (Fall)

49 **German Readings for Nonmajor Students** (3) Staff
Primarily for graduate students preparing for reading examinations; undergraduates admitted. No academic credit for graduate students. Prerequisite: Ger 4 or 47, or equivalent. (Spring)

51–52 **Introduction to German Literature—in English** (3–3) Thoenelt
Lecture, recitation, and discussion. Selected readings in German literature from the earliest periods to the present. (Academic year)

* With permission of instructor, Ger 9 or 10 may be taken concurrently with Ger 4.

Second Group

103–4 **Major Themes of German Literature—in English** (3–3) Thoenelt and Staff
Topics for 1986–87: Ger 103—The Faust myth in Western literature. Faust, or man's pursuit of happiness: its religious, political, and aesthetic possibilities and limitations. Original sin in the Bible: Faust in classical and Germanic mythology; modern Faust figures in the works of Goethe, Dostoevsky, Stephen Vincent Benét, Paul Valéry, Thomas Mann, and Camus. Ger 104—Literature and politics in Germany: *Kultur* and politics, the two faces of Germany. A survey of these two aspects of German history and German life. Selected readings from relevant literary and political documents by Walther v. d. Vogelweide, Kant, W. v. Humboldt, Frederick II, Mme. de Staël, Goethe, Schiller, Marx, Heine, Nietzsche, Thomas Mann, Heinrich Mann, Brecht, and Böll. (Alternate academic years)

111–12 **Comparative Studies in Germanic Literatures—in English** (3–3) Thoenelt and Staff
Topics for 1985–86: Ger 111—The human condition and four Western ways of life: French moralism, German *Bildung*, Marxism, and Existentialism. Selected readings from Montaigne, Goethe, Schiller, Thomas Mann, Marx, Brecht, Nietzsche, Martin Buber, and Camus. Ger 112—Why literature? What is literature? Views and perspectives on the "usefulness" and "uselessness" of literature in modern Western societies. From Plato to the 20th century. Selected works and excerpts from Plato, Aristotle, Shakespeare, Montaigne, Goethe, Schiller, Nietzsche, Thomas Mann, Camus, Böll, and others. (Alternate academic years)

126 **France and Germany—in English** (3) Thoenelt and Staff
Comparative study of two European ways of life as reflected and perpetuated by literature and philosophy. Relevant excerpts and documents from the 16th to the 20th century. (Summer)

131–32 **18th-Century German Literature—in German** (3–3) Thoenelt
Enlightenment, Storm and Stress, Classicism. Reading, lecture, and discussion. Central topic: *Geist und Tat*—the 18th-century concept of literature's formative function in society. (Alternate academic years)

141–42 **19th-Century German Literature—in German** (3–3) Steiner
Romanticism, Biedermeier, Young Germany, poetic realism. Second age of chivalry and *Sehnsucht*, revolution and counterrevolution in thought and literature. Birth and growth of modern nationalism and cosmopolitanism as reflected in the literature of the period. Reading, lecture, and discussion. (Alternate academic years)

151–52 **20th-Century German Literature—in German** (3–3) Steiner
The age of Nietzsche, Naturalism, Impressionism, Expressionism; Kafka, Thomas Mann, Hesse; émigré literature, contemporary drama; authors of Gruppe 47. Reading, lecture, and discussion. (Alternate academic years)

161–62 **Studies in Germanic Languages and Literatures—in English** (3–3) King
Topics for 1985–86: *Minnesang* (fall) and *Meistergesang* (spring). Middle High German poems of courtly love contrasted with Early New High German poetry practiced as a craft. Richard Wagner's treatment of *Minnesang* in his opera *Tannhäuser*; the legend of Tannhäuser and Mount Venus; the poetry contest at the Wartburg. Wagner's treatment of *Meistergesang* in his opera *Die Meistersinger von Nürnberg*; Hans Sachs as cobbler and poet.

179–80 **Advanced German Conversation and Composition** (3–3) Thoenelt
Discussions and compositions on literary and cultural topics, readings of newspaper articles, interpretations of selected texts (Gottfried Benn and Thomas Mann), grammar and style studies. (Alternate academic years)

183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy
Same as Engl/Fren/Hist/Rel 183 and Art 187.

SANSKRIT

105–6 **First-Year Sanskrit** (3–3) King
A year course: credit toward a degree at this University given on completion of Ger 106. Language, literature, and culture of ancient India. Essentials of grammar; reading of classical texts. Aural and oral pratice in language laboratory. Laboratory fee, $30 per semester. (Alternate academic years)

107–8 **Second-Year Sanskrit** (3–3) King
A year course: credit toward a degree at this University given on completion of Ger 108. Language, literature, and culture of ancient India. Continuation and review of grammar; reading of more difficult classical and Vedic texts. Aural and oral practice in language laboratory. Prerequisite: Ger 105–6 or equivalent. Laboratory fee, $30 per semester. (Alternate academic years)

GERONTOLOGY—GRADUATE PROGRAM

Professors R.G. Brown *(Academic Director)*, R.A. Kenney
Professorial Lecturer M.H. Morrison

Academic Committee: R.G. Brown, J.C. Heddesheimer, R.A. Kenney, S.D. Lind

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Master of Arts in the field of public policy with a concentration in gerontology, directed by the Committee on Gerontology and drawing upon faculty from various departments within the University and resource persons in the community.

The gerontology program derives its theoretical perspectives and substantive knowledge from several disciplines to provide a balanced study of the processes of aging and the societal reactions and responses to the aged and their problems, with the objective of preparing persons for positions that involve the planning, development, and evaluation of programs serving older persons. Each student will work closely with an advisor to design a program of studies appropriate to individual interests and professional objectives. Every student will have field experience in an agency involved in the planning and evaluation of services for the elderly. Prospective candidates should consult with the director of the gerontology program.

Master of Arts in the field of public policy with a concentration in gerontology—Prerequisite: a bachelor's degree with a *B* average (or equivalent) from an accredited college or university. In some cases, the applicant may be requested to take the Graduate Record Examination. Previous experience in gerontology is not essential; a variety of academic and experiential backgrounds are acceptable.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 42 semester hours of course work. there is no thesis requirement. Core courses required for all students: Econ 217; PSc 203; Stat 104, 183 (Stat 129 or Psyc 244 may be substituted for the latter); Gern 201, 205, 290; Soc 254, 280; Educ 344; and HSA 235. The remaining three courses are electives. All students are required to pass a Master's Comprehensive Examination.

201 **The Biology of Aging** (3) Kenney
The processes of aging in the various systems of the human body; principal illness patterns in the elderly; theories of the aging process. (Spring)

205 **Public Policy and Aging** (3) Morrison
The "political economy" of aging in our society. Political and governmental processes as they influence and are influenced by older persons; the impact of demographic trends and retirement patterns on the economic system. (Fall)

290 **Practicum in Gerontology** (3) Morrison
Field experience in an agency involved in the planning and evaluation of services for the elderly.

GREEK

See **Classics.**

HEALTH SERVICES ADMINISTRATION

Professors M.C. Devolites *(Emeritus)*, K.J. Darr, P.N. Reeves, P.S. Birnbaum, R.G. Shouldice, J. Ott, R.F. Southby *(Chairman)*
Professorial Lecturers H.L. Hirsh, H.R. Wertlieb
Associate Professors L.G. Pawlson, S.D. Lind, W. Greenberg, D.L. Zalkind, G.E. Crum, S.R. Eastaugh
Adjunct Associate Professors J.L. Ryan, J.C. Wilmot
Associate Professorial Lecturers C.V. Gordon, N.B. Hadley, S.B. Cohen
Assistant Professorial Lecturers D.P. Andrulis, D.F. Eversmann, Z.F. Acevedo, J.E. Clair
Lecturers W.T. Torgerson, D. Shepherd, J.P. Jacobs, B. Rouse

See the School of Government and Business Administration for programs of study leading to the degrees of Master of Health Services Administration* and Post-Master's Graduate Certificate in Health Services Administration and for areas of concentration in health services administration in programs leading to the degrees of Doctor of Business Administration and Doctor of Public Administration.

Second Group

142 **Financial Management in Health Care Institutions** (3) Eversmann
Consideration of the nature, analysis, and interpretation of accounting data. Cost accounting, budgeting, and internal control techniques; emphasis on their use in the management planning and control process. (Spring)

153 **Survey of Health Care Organization** (3) Clair
Introduction to the organization and delivery of health care services in the U.S. Emphasis on the structural features of and the resources available to the health care system. (Fall)

154 **Introduction to Hospital Management and Procedures** (3) Clair
Introduction to the structure and management of contemporary American hospitals; emphasis on the organization of hospital departments and the functions of the department manager. Prerequisite: HSA 153 or consent of instructor. (Spring)

170 **Quantitative Methods in Health Care Administration** (3) Gordon
Application of quantitative methods to the health services industry. Fundamental statistical techniques enabling the student to read, comprehend, critically appraise, and intelligently utilize the growing volume of quantitative research appearing in the health services literature. Familiarization with quantitative procedures applied to analyzing management problems in the operational environment. Emphasis on establishing a fundamental understanding of statistical ideas rather than on manipulating predeveloped formulas. (Fall)

190 **Special Topics in Health Care Administration** (3)
Experimental offering at the undergraduate level. (Fall and spring)

Third Group

202 **Introduction to Health and Medical Care** (3) Crum, Acevedo
Lecture and discussion (2 hours), laboratory (2 hours). Examination of the nature of health and disease, using biomedical, epidemiological, and ecological models. Introduction to the sociology and prevention of disease. Description and analysis of resource, process, and control components involved in delivering services—technology, manpower, patients, delivery mechanisms, and quality control. Medical terminology. (Fall and spring)

203 **Organization and Management of Health Services** (3) Shouldice
Application of management theory and concepts to health services systems and institutions. Characteristics, functions, and organizational structures of delivery systems. (Fall and spring)

* Accredited by the Accrediting Commission on Education for Health Services Administration.

207 **Health Services Information and Its Applications** (3) Zalkind
Introduction of the fundamentals of information systems and data processing in health care settings: data collection and computer processing skills; principles of managing the acquisition and development of health services information systems. Laboratory fee

208 **Quantitative Methods in Health Services Operations** (3) Zalkind, Cohen
Concepts and applications of statistical methods in health services operations. Probabilistic reasoning and statistical methodology. Sampling and study design. Critiques of statistical studies and reporting. Prerequisite: Stat 51 or permission of the instructor. (Fall and spring)

209 **Health Resources Management I** (3) Greenberg, Eastaugh
An introductory course designed to provide a balance between theoretical and practical approaches to the financial management of health care institutions, with emphasis on hospital examples. Specific attention is given to rate regulation, hospital reimbursement, hospital accounting, financial ratio analysis, financial feasibility studies, and strategic marketing.

210 **Health Resources Management II** (3) Greenberg
Economics of the health care sector. An economic analysis of public policy alternatives in the health industry. Roles of the physician, hospital, insurance, and other health care markets are examined.

212 **Introduction to Health Services Planning** (3) Reeves, Crum
Survey of community and institutional health systems planning and evaluation. Introduction to policy planning, strategic planning, project planning, marketing, and evaluation as they apply to health services. (Fall and spring)

215 **Health Services and the Law** (3) Hirsh
The sources of law and the legal processes affecting the health services system. Elements of administrative law and agency processes. Introduction to the legal relationships (e.g., torts, contracts, and insurance) of facilities, physicians, personnel, and patients. Legal aspects of labor relations; trends in health services delivery law. (Fall and spring)

221 **Health Systems Strategic Planning** (3) Reeves
Application of strategic planning concepts to health services. Study of the strategic planning process as a series of interrelated analyses and decisions, including representative analytic methods used in the most critical stages. Discussion of the relationships among strategic planning, project planning, marketing, and financial planning. (Fall)

223 **Policy in Strategic Health Services Planning** (3) Reeves
Effects of legal, political, social, governmental, and economic factors in strategic health planning. Emphasis on formulation, analysis, and implementation of state, local, and institutional health policies. The role of these policies as expressions of values that serve as guiding forces in the strategic planning process. (Spring)

225 **Developing National Health Services Policy** (3) Staff
Understanding and analyzing the processes by which health services policy is formulated and implemented at the federal level. Focus on Congress, the presidency, and the agencies. (Fall)

227 **Seminar: Ethics in Health Services Administration** (3) Darr
Investigating moral and ethical problems confronting the health services system. Understanding the legal, social, and policy implications of issues in medical and health services delivery, such as administrative and institutional ethics, professional codes, impaired professionals, death, fertility control, experimentation and new technology, and resource allocation. (Spring)

231 **Managing the Short-Term Hospital** (3) Darr
Lecture and discussion (2 hours), laboratory (2 hours). Organization, management, and interrelationships of hospital clinical, support, and administrative departments. Analyses of procedure and systems. Hospital personnel administration. Administrative ethics. Requirements of the Joint Commission on

Accreditation of Hospitals. Prerequisite: HSA 203 and Mgt 210, or permission of instructor. (Fall and spring)

233 **Delivery of Mental Health Services** (3) Andrulis
Study of the organizations and systems for delivery of mental health services; emphasis on management and financing treatment and rehabilitation facilities. (Fall and spring)

235 **Human Services Integration** (3) Reeves
Introduction to the concept of a human services system. Description and analysis of current human services programs as components of such a system and the roles of the public and private sectors in providing these services. Discussion of interorganizational theory as a basis for understanding current system configurations and for developing improved service delivery systems. (Spring)

236 **Introduction to Long-Term Care Administration** (3) Lind
An overview of the field of long-term care and its evolution within the health care and social service systems. The "continuum" of long-term care services, both in institutions and in the community, funding sources for these services, and policy issues involved in delivery of services. Site visits to long-term care programs. (Fall)

237 **Managing the Long-Term Care Institution** (3) Wertlieb, Lind
Organization and management of nursing homes, personal and residential care facilities, and institutions for other populations needing long-term specialty treatment. Emphasis on personal and professional skills necessary to provide a wide range of services and quality care in these environments. (Fall and spring)

238 **Ambulatory Health Services Management** (3) Shouldice
Introduction to the organization and management of ambulatory care. Presentation of models, financing mechanisms, institutional affiliations, estimating and planning for ambulatory care, and the use of solo and group practice of medicine as part of a total system of services delivery. (Fall)

239 **Management of Health Maintenance Organizations** (3) Shouldice, Ott
Basic principles and fundamentals of prepaid group practice and health maintenance organizations and other alternative financing/delivery mechanisms. Emphasis on planning, development, and operation of HMOs, including discussion of models, financial issues, consumers, and providers of care. (Spring)

245 **Case Studies in Health Services Administration** (3) Southby, Birnbaum, Devolites
Intensive qualitative and quantitative analyses of major problem areas in health system administration and planning, using the case study method. Cases cover the broad spectrum of health policy, planning, and management of the health services system. Serves as a capstone course for health services students. (Fall and spring)

252 **Comparative Health Services Systems** (3) Southby
Evaluations of various organizational patterns, functions, and trends in international health services delivery systems. Emphasis on sources of such differences and the significance of systems to the health status of a nation. (Spring)

255 **Issues in Gerontology** (3) Lind
Interdisciplinary seminar on the nature and problems of aging, including demographic biological, psychological, social, economic, environmental, and political perspectives on the status and needs of the older population. Theory and research; service delivery; attitudes and behaviors based on contact with older persons. (Fall)

257 **Advanced Health Resources Management** (3) Eastaugh
Methods, techniques, and policies used in health resources management. Prospective rate regulation under DRGs, capital investment decisions, buy–lease decisions, financial feasibility studies, cost accounting, multihospital

systems management, and strategic financial planning. Financial management of HMOs, teaching programs, nursing homes, hospices, and home health care programs. Prerequisite: HSA 209. (Fall and spring)

270 **Research in Health Services Administration** (3) Southby
Field research. Primarily for advanced students; open to others with consent of instructor. May be repeated for credit. (Fall and spring)

271 **Field Problem Studies in Health Services Administration** (3) Southby
Work experience guided by a qualified preceptor on selected management and planning issues and problems occurring in health services facilities, programs, and agencies. Primarily for advanced master's and doctoral students; open to other students by arrangement. May be repeated for credit. (Fall and spring)

273–74–75 **Residency I** (3–3–3) Staff
Twelve-month residency. Work experience guided by a qualified preceptor; periodic written progress reports and a written major report or selected field projects as required. (Fall and spring)

276–77–78 **Residency II** (3–3–3) Staff
For students who take additional residency experience. (Fall or spring)

285–86 **Readings in Health Services Administration** (3–3) Southby and Staff
Supervised readings in special areas of health services management and in policy and planning. Primarily for advanced students; open to others by arrangement. May be repeated for credit. (Fall and spring)

290 **Special Topics in Health Services Administration** (3) Hirsh
Experimental offering; new course topics and teaching methods. May be repeated for credit. (Fall or spring)

299–300 **Thesis Research** (3–3) Southby
(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students and are offered as the demand requires. They are open to the other graduate students at the discretion of the department.

310 **Health Resources Allocation Policies** (3) Southby, Greenberg
Study of major contemporary issues in health policy and health economics. Development and critique of policies designed to deal with current health issues. (Fall)

311–12 **Seminar: Public–Private Sector Institutions and Relationships** (3–3) Staff
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

330 **Health Services Delivery Policy** (3) Lind
Study of major contemporary issues in health services delivery. Development and critique of policies designed to deal with those issues. For doctoral and Post-Master's Graduate Certificate students; to be taken toward the end of course work for the degree. (Spring)

398 **Advanced Reading and Research** (arr.) Southby
Limited to doctoral students preparing for the general examinations. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Southby
Limited to doctoral candidates. May be repeated for credit. (Fall and spring)

HEBREW

See Classics.

HISTORY

Professors R.H. Davison, R.C. Haskett, R.P. Sharkey, H.M. Sachar, R.W. Kenny, P.P. Hill, L.G. DePauw, R. Thornton, L.G. Schwoerer, P.F. Klarén, R.E. Kennedy, Jr., W.H. Becker, C.M. Lovett
Adjunct Professor R.P. Multhauf
Professorial Lecturers S. Shaloff, D.C. Allard, M. Blumenson, J. Schlight
Associate Professors C.J. Herber, W.R. Johnson *(Chairman)*, R.A. Hadley, A.D. Andrews, J.O. Horton, L.P. Ribuffo, E. Berkowitz, M.A. Atkin
Adjunct Associate Professors L.J. Lear, A.L.K. Nelson
Assistant Professorial Lecturer E. Angel
Director and Principal Investigator of the First Federal Congress Project C. Bickford

Bachelor of Arts with a major in history (field-of-study or departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)

2. Required introductory courses—Hist 39–40, 71–72, or equivalent. Majors may waive one or more of the prerequisite courses by passing departmental examinations, by attaining scores of 600 or above on the College Board Achievement Tests, or by good performance on Advanced Placement Examinations. Credit for one or more of the prerequisite courses may be received by superior performance on departmental or Advanced Placement Tests. The department does not accord either waiver or credit by CLEP examination.

3. Required courses in related areas—(a) either 12 semester hours of an approved foreign language or (b) 9 semester hours in statistics (Stat 53, 105, and 107).

4. (a) *Field-of-study major*—Hist 199 (Proseminar), 6 semester hours of third-group courses, including at least 3 semester hours of research seminar, and the passing of the major examination in the senior year. In planning a program, the student, under the guidance of an advisor, should choose courses that will provide a broad understanding of diverse chronological and geographical aspects of the human experience.

(b) *Departmental major*—27 or more hours of second- and third-group courses, including Hist 199, 6 semester hours of third-group courses, including at least one research seminar, and 6 semester hours chosen from each of the following fields: (A) Europe—Hist 101, 105, 106, 109, 110, 111, 112, 121, 122, 123, 124, 125, 127, 131, 132, 136, 139, 140, 141, 142, 147, 148, 149, 150, 151, 152, 153, 154, 155, 157, 158, 183, 198; (B) United States—Hist 117, 118, 126, 128, 129, 133, 134, 137, 138, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 184, 185, 186, 197, 198; (C) Russia, Asia, Africa, and Latin America—Hist 107, 108, 116, 119, 120, 135, 145, 146, 158, 161, 162, 163, 164, 165, 166, 187, 188, 189, 193, 194, 195, 196, 198.

Courses numbered 198 and courses in the 700 Series may also satisfy one of the three field requirements. Departmental majors should inquire of the department chairman or major advisor concerning the specific applicability of these courses.

An Honors Program may be chosen by juniors with satisfactory scholastic records. Application to this program must be made before the beginning of the second semester of the junior year. Students accepted into the program take a 3-hour seminar in the second semester of the junior year and complete the research requirements for the history major by preparing the Senior Honors Thesis (Hist 191–92) in the final year of undergraduate study.

Minor in history—Undergraduate students who select a minor in history must ordinarily declare their intention to the departmental advisor no later than the beginning of their senior year. Such students may choose a nonspecialized history curriculum, or may concentrate in one area, such as ancient history, medieval history, early modern Europe, modern Europe, the Near East, Russia and East Europe, the United States, Latin America, or the Far East, or in one field, such as economic, social, intellectual, diplomatic, political, black, or women's history. In each case the program of courses will be planned in consultation with the history advisor. To meet the departmental require

ments for a minor, the student must complete at least 15 semester hours in approved courses with a grade of *C* or above. One 3-semester-hour seminar must be included in the program.

Master of Arts in the field of history—Prerequisite: a bachelor's degree from an accredited college or university with a major in history, or an equivalent degree; high scholastic standing; and approval of the department. Applicants from other institutions must present scores on the Graduate Record Examination with the Advanced Test in History and arrange for four persons, preferably former instructors, to send letters or reference forms to the Office of the Graduate School of Arts and Sciences.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of either a minimum of 30 semester hours of second- and third-group courses, including Hist 299–300 Thesis Research, or a minimum of 36 semester hours of second- and third-group courses, including at least two research seminars (6 semester hours). Hist 201 is required of candidates who have not previously had a course in historiography and historical method. At least 6 semester hours of each candidate's program must be in third- or fourth-group history courses; a maximum of 6 may be in approved courses outside the History Department. To receive graduate credit for second-group courses, master's candidates must arrange for extra work with the instructors. Each student works in two fields of history and is required to pass a Comprehensive Examination in each.

Master of Arts in the field of history with a concentration in historic preservation—Required: the general requirements stated under the Graduate School of Arts and Sciences. This 36-hour master's degree program combines courses in United States history and historic preservation. It includes at least 18 hours of U.S. social history, U.S. urban history, man-made America, and the seminar sequence in historic preservation. For other course distribution requirements, see the departmental graduate advisor. Candidates in this program may satisfy the tool requirement by passing an examination in measured architectural drawing.

Master of Arts in the field of history with a concentration in public policy—Required: the general requirements stated under the Graduate School of Arts and Sciences. This 36-hour program emphasizes the study of history as it relates to the analysis and conduct of public policy. History 213–14 and internship required. Additional course work to be chosen with advisor's approval.

Doctor of Philosophy in the field of history—Required: the general requirements stated under the Graduate School of Arts and Sciences, including the passing of a written examination in two appropriate foreign languages or in one foreign language and an approved tool subject, and the satisfactory completion of the General Examination in four fields. Normally, each doctoral candidate will work in one major (or general) field of study and three special fields. The major fields include the following: ancient history, medieval Europe, early modern Europe, modern Europe, United States, Latin America, modern Near East, modern Far East, and Russia and East Europe. Special fields may vary from the topical (e.g., U.S. social history, European intellectual history, historic preservation, etc.) to the chronologically limited fields (e.g., American colonial history, Tudor and Stuart England, etc.). A student may elect one special field outside the History Department if it is relevant to the program. Students having a special field in historic preservation may satisfy one tool requirement by passing an examination in measured architectural drawing.

Bachelor of Arts in Education and Human Development with a teaching field in history—Prerequisite: the education curriculum; required: the history option and the professional courses stated under the School of Education and Human Development.

Course Accessibility: All second-group courses are open to students without history course prerequisites with the exception of Hist 157 and 199.

First Group

39–40 **European Civilization in Its World Context** (3–3) Staff
Hist 39: Introduction to the political, social, economic, religious, and cultural history of Europe from about 800 A.D. to 1715. Hist 40: From 1715 to the present. (Academic year)

50 **Washington, D.C.: History, Culture, and Politics** (3) Gillette and Interdisciplinary Team
Same as AmCv/PSc/U&RP 50.

71–72 **Introduction to American History** (3–3) Staff
Hist 71: political, social, economic, and cultural forces of the United States, in world perspective, from the earliest settlements to 1876. Hist 72: from 1876 to present. (Academic year)

91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course offered by the Departments of East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Political Science, and Religion. A comprehensive and integrated introduction to the civilization and present problems of East Asia. (Spring)

Second Group

101 **The European Revolutionary Tradition, 1640–1917** (3) Kennedy
A comparative study of the English, French, and Russian revolutions with focus on theories of revolution, revolutionary ideology, millenarianism, and the revolutionary legacy inherited by third-world movements. (Fall)

105–6 **History of Science** (3–3) Multhauf
Hist 105: From ancient natural philosophy through the 17th-century scientific revolution. Hist 106: From the Industrial Revolution to the 20th-century amalgamation of science and technology. (Academic year)

107 **The Ancient Near East and Egypt to 322 B.C.** (3) Hadley
Survey of Egyptian, Mesopotamian, Anatolian, West Semitic, and Iranian civilizations from the Neolithic period to Alexander's conquest.

108 **Greece and the Near East, 359 B.C. to the Second Century A.D.** (3) Hadley
Survey of cultural, social, political, and economic developments in the Hellenistic world and societies of the Near East from the reign of Philip II to the height of Roman power and influence in these regions.

109 **Early Aegean and Greek Civilizations to 338 B.C.** (3) Hadley
Neolithic background; Bronze Age -Minoan, Helladic, and Mycenaean civilizations; classical Greek civilization to the Macedonian conquest. (Fall)

110 **The Roman World to 337 A.D.** (3) Hadley
Prehistoric Italy; rise and decline of the Roman Empire and Latin civilization; cultural, social, and political developments in the Greek world under Roman rule. (Spring)

111–12 **Medieval History** (3–3) Andrews
Hist 111: Failure of the old Roman Empire, formation of barbarian kingdoms in the West and their evolution to about 1000 A.D.; Byzantium and Islam at their apogee. Hist 112: Medieval European daily life, institutions, and creative movements to about 1400; the Crusades and the Near East to the rise of the Ottoman Turks. (Academic year)

116 **History of Africa** (3) Shaloff
Survey of political, cultural, and economic development from ancient times to the present. (Spring)

117 **Crisis or Conspiracy? A History of the International Politics of Oil** (3) Becker
The history of the international politics of oil, with special attention to developing relationships between major oil companies and governments here and abroad. (Summer)

118 **Business and American Life** (3) Becker
The historical interaction of business with other American institutions—religion, the family, law, education, government, labor unions, etc. (Summer)

119 **China in the 20th Century: Reform and Revolution** (3) Johnson
Origins, goals, substance, and significance of political, social, and intellectual upheavals in China from 1900 to the present. (Summer)

120 **The Medieval Near East** (3) Andrews
Byzantium and the Islamic World. The Crusades and their consequences. The Mongols, Ottoman Turks, and their neighbors of the 17th century; Eastern and Western perspectives. (Spring)

121 **The Renaissance in Western Europe** (3) Schwoerer
Study of the economic, political, intellectual, and cultural acceleration in Western Europe, beginning in the Italian city-states and spreading to France, Germany, and England, in the 14th through 16th centuries. (Fall)

122 **The Reformation in Western Europe** (3) Herber
Religious, political, and social consequences of the theological upheavals of the 16th century. (Spring)

123 **European Intellectual History I** (3) Kennedy
Popular culture; religion and science in the 17th century; the Enlightenment: Voltaire, Hume, Rousseau, Montesquieu, Beccaria, Diderot, Condorcet on religion, history, nature, society, and politics; the intellectual origins of the French Revolution. (Fall, even years)

124 **European Intellectual History II** (3) Kennedy
Intellectual responses to the French Revolution; 19th-century historical approaches to society, religion, economics, biology, ethics, and psychoanalysis: Hegel, Comte, Marx, Darwin, Nietzsche, and Freud; the intellectual origins of Nazism; literary, artistic, and philosophical responses to World War I. (Spring, odd years)

125 **Women in European History** (3) Schwoerer
A study of the role of women in the political, social, intellectual, and economic life of Europe from the Middle Ages to the 20th century. (Spring)

126 **Government Regulation and the American Experience** (3) Becker
The historical evolution of the ideas, policies, and consequences of government regulation of business in the United States. (Fall)

127 **Theories of History** (3) Lavine
Same as Phil 127.

128–29 **War and Society** (3–3) Allard
How wars, armed forces, and defense policies have affected British and American politics and society. Special attention to the relationship of defense and foreign policy, civil–military relations, the development of strategic thought, and the naval and military influence Britain and America have exerted on each other. Hist 128: 1776–1918. Hist 129: 1919–present. (Academic year)

131–32 **History of Germany** (3–3) Herber
Political, social, and cultural development. Hist 131: From mid-17th century to Bismarck. Hist 132: From William II to the present. (Academic year)

133 **Recent U.S. History, 1890–1941** (3) Ribuffo
Political, social, diplomatic, and intellectual developments, with particular emphasis on the "searching" '20s and New Deal. (Fall)

134 **Contemporary U.S. History Since 1941** (3) Ribuffo
Political, social, diplomatic, and intellectual developments, with particular emphasis on the Cold War, "silent" '50s, and disrupted '60s. (Spring)

135 **History of Soviet Intelligence Services** (3) Dziak
The role and impact of intelligence and security operations in Soviet domestic and foreign policy, from 1917 to the present. The course examines the literature and problems of Soviet intelligence operations; Tsarist antecedents; Lenin, the Cheka, and the formative years; operations under Stalin;

problems of the post-Stalin years; and operations in the Brezhnev era. Prerequisite: Hist 146 or PSc 131 or 168, or permission of instructor.

136 **Europe in the 20th Century** (3) Sachar
Diplomatic, political, and cultural developments from the turn of the century to the present. (Summer)

137 **U.S.–Soviet Strategic Relations Since World War II** (3) Thornton
Survey of U.S.–Soviet global rivalry from World War II to the present; comparative historical assessment of the changing strategic balance. (Spring)

138 **American Foreign Economic Policy in Historical Perspective** (3) Becker
Historical evolution of United States international economic relations, major issues of foreign economic policy, political problems in policy-making. Emphasis on period since 1945. (Spring)

139–40 **World History in the 20th Century** (3–3) Sachar
Diplomatic, political, and cultural factors. Hist 139: From the turn of the century to the Munich settlement of 1938. Hist 140: From the Munich settlement to the present. (Academic year)

141 **History of France I** (3) Kennedy
Old Regime: Louis XIV, demography, peasants, bourgeois, nobles; Church–Protestant–Jewish relations; salons, Enlightenment, and *philosophes*; literacy and education; Robespierre and Revolution; Napoleon. (Fall, odd years)

142 **History of France II** (3) Kennedy
The Revolutionary tradition and authoritarianism from the Restoration to De Gaulle; the events of 1848, socialism and the class struggle; women, marriage, morals, and population; industrialization and rural France; de-Christianization, Catholic integralism, and worker priests; France's decline as a world power; its intellectual and artistic leadership. (Spring, even years)

145 **Russia to 1801** (3) Atkin
Survey of Russian history from the rise of the Kievan confederation in the ninth century to the establishment of Imperial Russia as a European great power. Attention will be given to the political, socioeconomic, and cultural history of the East Slavs, especially the Russians. (Fall)

146 **Russia and the Soviet Union from 1801 to the Contemporary Era** (3) Atkin
Survey of Russian and Soviet history from the reign of Alexander I to the post-Stalin era. Attention will be given to the contending forces of revolution, reform, and conservatism; diplomatic relations; economic development; social change, and Russian culture. (Spring)

147 **Economic History of Modern Europe** (3) Sharkey
Joint offering of the History and Economics Departments. Economic development since the Middle Ages; emphasis on the period following the Industrial Revolution. Evolution of capitalism and its impact on the societies of Europe. (Spring)

148 **The French Revolution** (3) Kennedy
Social, political, economic, and cultural history of the decade of revolution, 1789–1799. Attention to its structural consequences in France and in Europe at large. (Summer)

149–50 **European Diplomatic History** (3–3) Davison
Emphasis on policies and actions of the great powers and their statesmen. Issues of war and peace, international crises, nationalism, alliances, and tensions. Hist 149: 1812 to 1890. Hist 150: Since 1890. Students who receive credit for Hist 150 cannot receive credit for Hist 157. (Academic year)

151–52 **History of England** (3–3) Kenny
Development of English civilization and its impact on Western culture. Hist 151: To 1689. Hist 152: Since 1689. (Academic year)

153 **Tudor England** (3) Kenny
Aspects of the constitutional, social, intellectual, economic, and religious development of England, 1485–1603. (Fall)

154 **Stuart England** (3) Schwoerer
Grand Rebellion, Restoration, and Glorious Revolution. The political, religious, socioeconomic, and intellectual developments in England, 1603–1714. (Spring)

155 **History of Modern Ireland** (3) Kenny
The political and cultural development of Ireland since the Middle Ages and the continuing interaction between Ireland and England, with emphasis on the period from the Act of Union of 1801 to the Partition of 1923.

157 **20th-Century European Diplomatic History** (3) Sachar
The main currents, with necessary 19th-century background. Students who receive credit for Hist 157 cannot receive credit for Hist 150. (Fall)

158 **Modern Jewish History** (3) Sachar
A secular history of the Jewish people from the 18th century to the present state of Israel; emphasis on European political, economic, and cultural influences. (Spring)

161 **Revolution in 20th-Century Latin America** (3) Klarén
Examination of the major social revolutions in modern Latin America, especially in Mexico, Cuba, Nicaragua, and Central America; their origins, social composition, leadership, ideology, and programs. (Fall)

162 **20th-Century Latin America** (3) Klarén
A survey of the main societal trends shaping Latin America in this century, with particular emphasis on such themes as populism, urbanization, reformism, modernization, nationalism, Marxism, the military dictatorship, and the development process. (Spring)

163–64 **History of Latin America** (3–3) Klarén
Hist 163: Analysis of Spanish and Portuguese imperialism in the New World, 1492–1820. Hist 164: A problems approach to Latin America, 1820 to the present; thematic emphasis on neocolonialism, corporatism, liberalism, *caudillismo*, modernization, populism, and revolution. (Academic year)

165 **Latin America and the Industrializing World, 1850–present** (3) Klarén
Examination of the political/diplomatic responses of Latin American nations, individually and collectively, to the expanding industrial powers of the Northern hemisphere in the 19th and 20th centuries, particularly to the United States. (Fall)

167 **Man-Made America: The Old Colonial Scene** (3) Haskett
An interpretive tour through the early American landscape, 1607–1750. Heavily illustrated with color slides. Same as AmCv 167. (Fall)

168 **Man-Made America: Views of a New Nation** (3) Haskett
An interpretive tour through the early American landscape, 1750–1820. Heavily illustrated with color slides. Same as AmCv 168. (Spring)

169 **The American Revolution** (3) DePauw
The political, intellectual, social, military, and economic impact of the events surrounding the separation of the United States from the British Empire. Special attention to the influence of non-elite groups. (Fall)

170 **U.S. Early National History** (3) Hill
Political, diplomatic, economic, and social history of the early republic, 1789–1828. (Fall)

171–72 **U.S. Social History** (3–3) Horton
Hist 171: Daily life, institutions, intellectual and artistic achievements of the agrarian era, 1607–1861. Hist 172: The urban-industrial era from 1861 to present.

173 **Afro-American History** (3) Horton
Survey of the Afro-American experience, emphasizing the contributions of black Americans to and their impact upon American history. Same as AmCv 173. (Fall)

174 **Special Topics in Afro-American History** (3) Horton
Concentration on specific issues central to the Afro-American experience.

Consult Spring *Schedule of Classes* for issues to be addressed. Same as AmCv 174. (Spring)

175–76 **U.S. Political History** (3–3) Haskett
A study of power: who gets what, where, when, and how. Hist 175, 1763–1865; Hist 176, 1865–1960. (Academic year)

177 **The Antebellum South** (3) Horton
Investigation of political, economic, intellectual, social, and cultural characteristics of the American South prior to 1860. Special attention to myths associated with the South, ideologies supporting the slave system, and cultural practices among the white, black, and Indian populations. (Fall, alternate years)

178 **Making and Braking the Welfare State** (3) Berkowitz
An examination of America's changing approaches to health and welfare problems, explaining the origins of modern entitlement programs and examining ways in which these programs have been adapted and reshaped. Topics such as welfare reform and health insurance are covered. (Spring)

179–80 **U.S. Economic History** (3–3) Sharkey
Joint offering of the History and Economics Departments. Economic growth from colonial times to the present. Development of various sectors in the economy and their interdependence. Hist 179: 1607–1865. Hist 180: 1865 to the present. (Academic year)

181–82 **U.S. Diplomatic History** (3–3) Hill
American foreign relations from the era of the American Revolution. Hist 181: to 1898. Hist 182: 20th century. (Academic year)

183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy
An interdisciplinary examination of the rise of Western individualism from the Renaissance to the American and French Revolutions. Analysis of the tension between reason and religious and popular traditions. Guest lectures by Art, English, Germanic Languages and Literatures, and History faculty. Core course for Early Modern European Studies major but open to other undergraduate and graduate students as well. Same as Engl/Fren/Ger/Rel 183 and Art 187. (Spring)

184 **Civil War and Reconstruction** (3) DePauw
How tensions between the sections developed into violence, how a total war was fought on American soil, and how the experience of war affected the generation that lived through it. (Spring, alternate years)

185 **History of Women in America** (3) DePauw
Survey of the political, economic, social, military, religious, intellectual, and cultural practices in North America from 1000 A.D. to the present as these have affected and been affected by the female half of the population. Same as AmCv 185. (Spring, alternate years)

186 **U.S. Urban History** (3) Gillette
The American city from colonial foundations to the present, relating social and economic forces to physical form. Special emphasis on transitions from pre-industrial to industrial to metropolitan forms, focusing on implications for public policy and historic preservation. Same as AmCv 186. (Fall)

187 **History of Modern China** (3) Johnson
China since 1840, particular attention to political developments. (Fall)

188 **History of Chinese Communism** (3) Thornton
Survey of the leadership, ideology, structure, and foreign and domestic policies of the Chinese Communist Party from its inception to the present. (Fall)

189 **History of Modern Japan** (3) Sigur
Japan's century of modernization—from the Meiji Restoration of 1868 to the present. Emphasis on historical, political, economic, and cultural factors. (Fall)

190 **Ethnohistory** (3) Wagner, Humphrey
Same as Anth 190.

191–92 **Senior Honors Thesis** (3–3) Herber
Required of and open only to undergraduate honors candidates in history. (Academic year)

193 **History of the Near East** (3) Davison
Byzantine, Arab, Persian, and Islamic backgrounds; rise and decline of the Ottoman Empire; action of European powers in the area; Ottoman breakup into the Turkish Republic and other states. (Fall, even years)

194 **History of the Modern Near East** (3) Davison, Sachar
Beginning with Napoleon's invasion of Egypt. Development of nationalism and of modern states; impact of the West on culture and institutions; great-power imperialism; crises of Turkish Straits, Suez, Arab–Israeli relations; and other issues. (Fall, odd years)

195 **Traditional Civilizations of China and Japan** (3) Johnson
Intellectual, institutional, and social development of the traditional civilizations of China and Japan from their origins to 1600. (Fall)

196 **The Modern Transformation of China and Japan** (3) Johnson
The social, political, and intellectual transformation of China and Japan from the mid-19th century to the present. (Spring)

197 **Oral History and Interview Techniques** (3) Staff
Same as AmCv 197.

198 **Special Topics in History** (3) Staff
Historical perspectives on great issues of past and present. New topic each semester.

199 **Proseminar: Readings for the History Major** (3) Staff
Required of senior history majors. Readings and discussions on major trends in history; representative selections from the classics of historical literature. Students who receive credit for Hist 199 cannot receive credit for Hist 201. (Fall and spring)

Third Group

Any student who has had the appropriate preparation may, with the consent of the instructor, enroll in a third-group course. Enrollment is not restricted to history majors and graduate students. History majors will satisfy the third-group requirement by taking either two courses for research or one course for research and one course for a readings program.

201 **History and Historians** (3) Staff
Historiography and historical method for graduate students. Readings and discussions on major trends in history; selections from classics of historical literature. Students who receive credit for Hist 201 cannot receive credit for Hist 199. (Spring)

203–4 **Seminar: Research or Readings** (3–3) Staff
Offered on demand for individual research programs. Prerequisite: approval of department. (Academic year)

205 **Readings Seminar: Evolution of Nationalism in Eastern Europe** (3) Staff
Formation of national consciousness and emergence of modern East European states after World War I. Developments of the interwar period. Open to qualified undergraduate seniors. (Fall)

206 **Readings Seminar: Revolution in Eastern Europe** (3) Landa
Transformations of East European states during World War II. Resistance movements, communization, and national self-assertion in the immediate post-Stalin period. Open to qualified undergraduate seniors. (Spring)

209 **Readings/Research Seminar: Topics in Ancient History** (3) Hadley
Readings on general topics in the history of the ancient Near East, Greece, or Rome. Topics to be announced in the *Schedule of Classes*. Students with working knowledge of the appropriate language(s) may receive research credit.

211 **Readings/Research Seminar: Medieval History** (3) Andrews
Prerequisite: Hist 111–12 or equivalent. Students with working knowledge of

Latin may receive research credit. Focus on a particular area and period, with emphasis on interdisciplinary research techniques.

213–14 **History in Public Policy** (3–3) Berkowitz
Seminar in the use of historical insights and methods in policy-making, with emphasis on domestic issues. Assessment and use of primary sources for policy analysis and the use of historical analogy in policy formulation.

217 **Readings/Research Seminar: Russian and Soviet Thought** (3) Atkin
Selected topics in the intellectual, social, and cultural history of 19th- and 20th-century Russia and Soviet Union.

218 **Readings/Research Seminar: Soviet Nationalities** (3) Atkin
An examination of the relationship between the U.S.S.R.'s multinational composition and its domestic political, economic, social, and cultural policies and foreign relations. (Fall)

219 **Internship in History and Public Policy** (3) Berkowitz
Supervised participation in an office or agency concerned with the formulation of public policy; terms of the internship are arranged with the Director of the History and Public Policy Program. Enrollment restricted to students in the History and Public Policy Program. (Fall and spring)

220 **American Business History** (3) Becker
The history of American business institutions in manufacturing, distribution, transportation, and finance. Particular attention will be given to the period since industrialization, with consideration of business institutions in their economic, legal, governmental, and social contexts. (Fall)

221 **Comparative Business History** (3) Becker
A readings or research seminar on the history of business institutions in manufacturing, distribution, transportation and finance in England, Germany, France, and Japan. The course will be primarily devoted to the period since industrialization, studying business institutions in their economic, legal, governmental, and social contexts. (Spring)

222 **History of U.S. Government Regulation, 1886 to the Present** (3) Becker
An overview of the political history of regulation beginning with the legislation creating the Interstate Commerce Commission in 1886. Offered off campus.

224 **Readings/Research Seminar: European Intellectual History** (3) Kennedy
Cultural history of the French Revolution. Interrelated changes in political and economic thought, theater, arts, religion, and science from 1789 to 1799. Continuity or discontinuity with pre- and post-revolutionary cultural life.

225 **History of Washington, D.C.** (3) Gillette
Same as AmCv 225.

228 **Readings/Research Seminar: Modern Military and Naval History** (3) Staff
Discussion, readings, and research in 20th-century European and American military and naval history.

229 **Seminar: World War II** (3) Staff
Examination of statecraft and the management of force before, during, and after World War II. Special attention to broad aspects of military policy and strategy and their interaction with international politics and diplomacy.

230–31 **Readings/Research Seminar: Strategy and Policy** (3–3) Schlight
Hist 230: A study of the historical development of strategy and the relationship of military thought to national policy. Hist 231: 20th-century strategic thought. (Academic year)

232 **Comparative Communist Systems I** (3) Wolchik
Same as PSc 232.

233 **Comparative Communist Systems II** (3) Wolchik
Same as PSc 233.

234 **Modern Archives Administration** (3) Peterson*
Open to history graduate students and undergraduate majors. Lectures and discussion on all phases of administering archival materials. Classes at

* Trudy Peterson is Acting Deputy Assistant, National Archives.

National Archives. Students must enroll before September 1 for October session, before April 1 for June session.

237 **Readings Seminar: Soviet Foreign Policy, 1917–1964** (3) Petrov
Concepts and perceptions guiding Soviet relations with the outside world. From the blockade and intervention, through years of isolation, World War II, the Cold War, to "peaceful coexistence" and detente. Open to qualified undergraduate seniors. (Fall and summer)

239 **Readings/Research Seminar: Early Modern European History** (3) Schwoerer
Topics selected from Western European history of the 14th through 17th centuries. Readings or research, depending upon students' interests and curricular needs.

241 **Readings/Research Seminar: Modern European History** (3) Herber
Prerequisite: appropriate preparation and consent of instructor

246 **Readings Research Seminar: History of Modern Russia and Soviet Union** (3) Atkin
Selected topics in the domestic history of modern Russia and Soviet Union. Readings or research, depending upon students' interests and curricular needs. (Fall)

247 **Readings/Research Seminar: The Theory and Practice of Modern Imperialism** (3) Sharkey
Critical analysis of Marxist and non-Marxist theories of modern imperialism in the light of late 19th- and 20th-century European and American experiences in Asia, Africa, and Latin America. (Fall)

248 **Readings Seminar: Modern European and Near Eastern History** (3) Davison
Admission by permission of instructor. (Spring)

249 **Research Seminar: European Diplomatic History** (3) Davison
Research seminar in individually selected topics concerning the foreign policies, actions, and interrelations of the European great powers and their statesmen in the 19th or 20th century. Reading knowledge of one language other than English required. (Fall)

251 **Readings/Research Seminar: English People and Institutions** (3) Kenny, Schwoerer
Selected topics in the political, social, intellectual, and economic history of England. Focus upon one time period and special area of interest.

253–54 **Readings Seminar: History of Sino-Soviet Relations** (3–3) Thornton
Seminar designed to develop analytic and historiographic skills. Fall: turn of the century to 1949; spring: Korean War to the present. (Alternate academic years)

255–56 **Readings Seminar: U.S.–Soviet Strategic Relations Since World War II** (3–3) Thornton
Seminar designed to develop a conceptual framework for understanding contemporary U.S.–Soviet relations. Fall: World War II to 1965; spring: 1965 to the present. (Academic year)

258 **Communist Party of the Soviet Union** (3) Sodaro
Same as PSc 258.

259–60 **Research Seminar: Problems in U.S.–Soviet–Chinese Relations** (3–3) Thornton
Development of scholarly skills through preparation of a research paper. Prerequisite: Hist 254 or 255 or permission of instructor. (Alternate academic years)

261 **Readings Seminar: Topics in 20th-Century Latin America** (3) Klarén
Admission by permission of the instructor. (Fall)

262 **Research Seminar: Agrarian Society and Economic Change in Modern Latin America** (3) Klarén
Research on the impact of modernity (e.g., foreign capital, immigration,

internal migrations, capitalism, imperialism) on traditional rural society. Admission by permission of instructor. (Spring) Horton

271–72 **U.S. Social History** (3–3)
Hist 271: Readings seminar on American daily life, institutions, and intellectual and artistic achievements. Hist 272: Research seminar. Haskett

275–76 **Readings/Research Seminar: U.S. Political and Colonial History** (3–3)
Research or readings, depending on students' interest and curricular needs. Topics on various aspects of the colonial period or political aspects of various periods. Admission by permission of instructor. (Academic year)

277–78 **Historic Preservation: Principals and Methods** (3–3) Longstreth
Same as AmCv/U&RP 277–78.

279 **Readings/Research Seminar: American History** (3) Hill
Readings or research, depending on students' interests and curricular needs. Admission by permission of instructor. (Summer)

281–82 **Readings/Research Seminar: U.S. Diplomatic History** (3–3) Hill
Research or readings, depending on students' interest and curricular needs. Hist 281: 1776–1890; Hist 282: 1890–1950. (Academic year)

283–84 **Readings/Research Seminar: Recent U.S. History** (3–3) Ribuffo
Prerequisite: 6 semester hours of 100-level American history courses. Research or readings, depending on students' interests and curricular needs.

285 **Readings Seminar: Military and Women's History** (3) DePauw
Admission by permission of instructor. (Fall, alternate years)

286 **Research Seminar: Military and Women's History** (3) DePauw
Admission by permission of instructor. (Spring, alternate years)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Same as Anth/Econ/Geog/Span 287, and PSc 285. Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

289 **Readings/Research Seminar: Modern Japanese History** (3) Sigur
Selected topics in modern Japanese history from the Meiji Restoration of 1868 to the present. Research or readings depending on students' interests and curricular needs. (Spring)

291 **Readings/Research Seminar: 20th-Century History** (3) Sachar
Research or readings on selected topics. (Fall)

292 **Israel, Zionism, and the Arab World** (3) Sachar
Research seminar. (Spring)

293 **Research Seminar: Modern East Asian History** (3) Johnson

294 **Research Seminar: The Modern Near East** (3) Davison
Readings, discussion, and research in selected political, economic, social, cultural, and international developments in the 19th and 20th centuries concerning countries from the Balkans, through Turkey and the Arab countries, to Iran. (Spring)

295–96 **Readings Seminar: Modern East Asian History** (3–3) Johnson

297 **Special Topics Seminar** (3) Staff
Open to doctoral and master's candidates and qualified undergraduates. May be repeated for credit. Offered whenever five or more students can be enrolled.

298 **Dumbarton Oaks Courses** (arr.)
Courses offered each year by scholars in residence at Dumbarton Oaks, Trustees for Harvard University, are open to qualified graduate and undergraduate students with permission of department chairman. Topics will be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs. Staff

299–300 **Thesis Research** (3–3)
(Fall and spring)

Fourth Group
Prerequisite to all fourth-group history courses: consent of instructor.

Fourth-group history courses are primarily for doctoral students, but master's degree candidates may be admitted.

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. Institute policies are set by a central committee on which each member institution is represented. Doctoral students enrolled in the Institute seminar are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301–12. Students wishing to register for these courses should consult the chairman of the History Department.

301–12 **Folger Institute Seminars** (3) Staff
Topics will be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

342 **Readings in Modern European History** (3) Davison (Spring)
From the French Revolution to the period following World War I.

379–80 **Readings in Economic History** (3–3) Sharkey
Joint offering of the History and Economics Departments. Hist 379: American economic history. Hist 380: Modern European economic history. (Academic year)

398 **Advanced Readings and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

HUMAN KINETICS AND LEISURE STUDIES

Professors L.M. Stallings, J.L. Breen, J.E. Snodgrass *(Chairman)*, D.C. Paup, N.M. Alsehrewerdi *(Visiting)*
Professorial Lecturers C.A. Troester, Jr., W.M. Kane
Associate Professors L.H. George, M.R. Withers, N.D. Johnson
Assistant Professor H. Nashman
Research Instructor N.B. Smith
Lecturers E.A. Burkhardt, J.J. Goldblatt, C.D. Cox, W. Woodson, W.K. Ellis, D.V. Appel, M.K. Grut, G.V. Swengros, R.L. Vann, B.M. Zeidman, G.L. Gimelstob, L.J. Grollman, C.H. Harrison, P.A. Sullivan, L.W. Hall, D.G. Leopold, R.T. Rothstein, R.M. Shorjannati, J.C. Harper

See the School of Education and Human Development for programs of study leading to the degrees of *Bachelor of Science in Human Kinetics and Leisure Studies* (opportunity for specialization in elementary/secondary physical education, exercise and sport, dance education, dance as a performing art, dance therapy) and *Master of Arts in Education and Human Development* (with specialization in dance, exercise science, therapeutic recreation, and individualized programs in human kinetics and leisure studies).

The University is not responsible for injuries received in any of the activities of the Department of Human Kinetics and Leisure Studies, and the student assumes full responsibility therefor.

First Group
With the exception of students pursuing undergraduate degrees in the School of Education and Human Development, credit for HKLS activities courses is not recognized for the baccalaureate. Some HKLS activities courses may be repeated for credit by those students who are eligible to receive credit for such courses.

10 **Beginning Badminton** (1) Breen
13 **Beginning Ballet Technique** (1) Staff
14 **Beginning/Intermediate Ballet Technique** (1) Staff
17 **Beginning Modern Dance Technique** (1) Staff

18 **Beginning/Intermediate Modern Dance Technique** (1) Staff
19 **Dance** (1) Staff
20 **Beginning/Intermediate Golf** (1) Staff
21 **Foil Fencing** (1) Staff
22 **Basketball** (1) Staff
24 **Volleyball** (1) Staff
26 **Karate** (1) Staff
27 **Tennis** (1) Staff
28 **Intermediate Karate** (1) Staff
29 **Yoga** (1) Staff
30 **Body Conditioning** (1) Staff
31 **Roller Skating** (1) Staff
32 **Beginning Swimming** (1) Staff
33 **Swimming/Life Saving** (1) Staff
34 **Intermediate Swimming** (1) Staff
36 **Springboard Diving** (1) Staff
37 **Soccer** (1) Staff
38 **Racketball** (1) Staff
39 **Handball** (1) Staff
40 **Squash** (1) Staff
41 **Team Handball** (1) Staff
42 **Aerobic Dance** (1) Staff
43 **Tai Chi** (1) Staff
45 **Experimental Activities** (1) Staff
Topic and amount of laboratory fee (if charged) announced in *Schedule of Classes*. May be repeated for credit.
50 **CPR, First Aid, and EMT** (2) Staff
Training for certification in cardiopulmonary resuscitation, first aid, and emergency medical training. Laboratory fee, amount announced in *Schedule of Classes*.
51 **Gymnastics** (1 or 2) Staff
Emphasis on apparatus and trampoline.
52 **Dance Technique I** (1, 2, or 3) Staff
53 **Dance Technique II** (1, 2, or 3) Staff
54 **Intermediate/Advanced Tennis** (1 or 2) Staff
Development of skills, theories of strategy; emphasis on competitive play as a lifetime sport.
55 **Swimming—Water Safety Instructor Certification** (2) Staff
56 **Scuba Diving** (2) Staff
Laboratory fee, amount announced in *Schedule of Classes*.
57 **Intermediate/Advanced Badminton** (1 or 2) Breen
(Spring)
58 **Intermediate Ballet Technique** (1, 2, or 3) Staff
59 **Team Sports** (2) Staff
(Fall)
60 **Racket Sports** (2) Staff
(Spring)
61 **Aquatic Leadership** (2) Staff
(Fall)
62 **Conditioning/Weight Training** (2) Staff
(Spring)
63 **Games and Movement Activities for Children** (2) Staff
(Spring)
64 **Horseback Riding** (2) Staff
Laboratory fee, amount announced in *Schedule of Classes*.
65 **Skiing** (2) (Spring) Staff
Laboratory fee, amount announced in *Schedule of Classes*.
66 **Synchronized Swimming** (2)

Staff

68 **Sport Clinics and Workshops** (1 to 3)
Special intensive study and skill development. There may be a laboratory fee, amount announced in *Schedule of Classes*.

Staff

87–88 **Sign Language and Deafness** (3–3)
Same as Educ 87–88.

Staff

100 **Experimental Course** (3)
Topic to be announced in *Schedule of Classes*.

Second Group

Swengros

101 **Issues in Physical Education, Exercise, and Sport** (3)
Issues in physical education and sports programs in school and industry. Includes philosophy and curriculum.

Snodgrass

102 **Movement Analysis and Activities** (3)
Human movement concepts applied to various fundamental activities and sports. (Fall)

Snodgrass

103 **Professional Foundations and Concepts of Human Kinetics and Leisure Studies** (3)
Nature, scope, and scientific basis of human kinetics and leisure studies; orientation to professional competencies.

Smith

105 **Introduction to Therapeutic Recreation/ Adaptive Physical Education** (3)
Philosophy, methods, and concepts relating to therapeutic recreation for the ill, aged, and disabled. Concepts in program planning, leadership, and adaptation of activities to special groups. Includes field visitations and analysis of activities. (Fall)

Shor-Jannati

106 **Introduction to Dance Therapy** (3)
General survey of dance therapy areas from theoretical and experimental points of view. Exploration of professional opportunities and training. (Fall)

Johnson

107 **Ethnic Dance** (2)
Methods and materials of European folk and social forms of dance. Laboratory experiences assigned. (Spring, odd years)

Woodson

108 **Dance Improvisation** (3)
Awareness of body movements, environment, group dynamics, performances and composition through improvisational technique. (Spring)

Withers

109–10 **Dance Composition** (3–3)
HKLS 109. Basic elements and principles of composition. HKLS 110: Advanced problems in composition. Prerequisite: HKLS 108 or equivalent. (Academic year)

Staff

111–12 **Sports Education Technique** (3–3)
Techniques for teaching individual, dual, and team sports. May be repeated for credit. (Academic year)

Nashman, Paup

113–14 **Practicum** (3–3)
Pre-practice teaching or practical experience in related disciplines. (Academic year)

Appel

115–16 **Movement Technique for Theater** (2–2)
Basic body awareness, sensory awareness, and movement exploration. Analysis of movement and dramatic justification of movement. May be repeated for credit. (Fall and spring)

Johnson

117 **Dance Education** (3)
Organizational, methodological, philosophical, and conceptual approaches to the teaching of dance in academic and nonacademic settings. Prerequisite: HKLS 157. (Fall, odd years)

Staff

118 **Special Problems in Dance Composition** (1)
Work with elements of movement leading to short composition studies. Prerequisite: HKLS 109–10 or equivalent. (Fall and spring)

Withers

119 **Creative Dance for Children** (3)
Dance as an expressive art medium for children; concepts, principles,

methods and materials. Emphasis given to dance in elementary education with consideration for special education. (Spring, odd years) Staff

120 **Repertory** (1 or 2)
Study and performance of dance works. Admission by permission of instructor. May be repeated for credit. (Fall and spring) Staff

121 **Dance Technique III** (1, 2, or 3)
Intermediate/advanced dance technique. May be repeated for credit. (Fall and spring) Kane

122 **Methods and Materials for Health Education** (3)
Conceptual approach to curriculum design and teaching, including planning and organization, methodology, selection and use of materials, and evaluation: basic health knowledge. (Spring) Staff

123 **Dance Technique IV** (1, 2, or 3)
Advanced dance technique. May be repeated for credit. (Fall and spring) Stallings

129 **Introduction to Motor Learning** (3)
Concepts of skill learning applied to teaching, coaching, and performing motor skills. (Spring) Snodgrass

130 **Introduction to Motor Development** (3)
Study of the evolvement and refinement of fundamental movement skills throughout the life span. (Fall) Nashman, Paup

133 **Student Teaching** (6 to 12)
Prerequisite: HKLS 113–14 or equivalent. Admission by permission of instructor. (Fall and spring) Kane

134 **Sports and Nutrition** (3)
The nutrition needs for recreational exercise and sports; skills in assessing nutrition needs; development of individual nutrition programs that are sport/activity-specific; and identification and correction of nutrition problems affecting sports performance. (Fall) Johnson

135–36 **Dance History** (3–3)
Study of dance from antiquity to present; emphasis on cultural significance of dance as art, education, and social behavior. (HKLS 135—fall, even years; HKLS 136—spring) Staff

137 **Dance and Movement Analysis** (3)
Concepts and elementary principles of movement analysis with emphasis on effort and shape. (Spring) Harper

138 **Organization, Administration, and Management of Physical Education, Sports, and Exercise Programs** (3)
Curriculum, administration, and management related to physical education, sports, and exercise programs. Sullivan

139 **Principles of Coaching** (3)
Study of behavioral patterns and interactions related to individual and team sports. (Spring) Sullivan

140 **Psychology of Sport** (3)
Study of psychological aspects of athletes, teams, and competition in athletics, including personality, motivation, performance level, achievement, and behavioral change strategies; social factors, training events, and measurement techniques. (Fall) Staff

141–42 **Theater Production for Dance** (3–3)
Theory and practicum in technical aspects of dance production, lighting, sound, theater management, costuming, make-up, publicity, promotion, and audiovisual techniques. (Materials to be purchased.) (Academic year) Withers

144 **Choreography** (3)
Solo and group. May be repeated for credit. Prerequisite: HKLS 109–10 or equivalent; HKLS 141–42 recommended. (Fall) Stallings

150 **Introduction to Human Anatomy** (3)
Systematic study of the structure of the human body, with emphasis on joints, muscles, and neuromuscular mechanisms. (Fall and spring)

151 **Kinesiology** (3) Paup
Analysis of human movement, including mechanical physics, anatomy, and physiology. Prerequisite: an approved course in anatomy. (Spring)

156 **Application of Recreational Skills to Contemporary Life Styles** (3) George
Development of recreational skills; emphasis on local opportunities for recreational activities. Current trends in community recreational development and program planning. May be repeated for credit with permission of instructor. (Fall and spring)

157 **Dance Technique Theory** (3) Withers
Theoretical foundations of dance. Applied principles of kinesiology, analysis and practice of contemporary dance techniques. (Fall)

158 **Safety: Prevention and Care of Sports Injuries** (3) Grollman, Harrison
Safety education, liability, prevention and care of sports injuries; related personnel, facilities, and equipment.

164 **Physiology of Exercise** (3) Paup
The physiological functions of the body and the effect of exercise on these functions. Prerequisite: HKLS 150 or permission of instructor. (Fall)

171 **Current Professional Literature and Competencies** (3) Snodgrass
Study of current literature with implications for HKLS specializations; use of library resources and retrieval systems, evaluation of professional competencies. Prerequisite: HKLS 103 or permission of instructor.

172 **International Experiences** (1 to 6) Snodgrass and Staff
Travel to a foreign country for study of a specific topic.

173 **Independent Study** (1 to 3) Snodgrass and Staff
Individually designed model for intensive study in an area of special interest. Prerequisite: demonstrated competency for independent work and permission of advisor and instructor. May be repeated for credit.

175 **Music for Dancers** (3) Staff
Rhythmic theory and analysis; resources in music and accompaniment principles for dance. Prerequisite: basic knowledge of rhythmic theory. (Spring, even years)

184 **Workshop** (1 to 3) Snodgrass and Staff
Titles announced in *Schedule of Classes*. May be repeated for credit with permission of advisor.

200 **Experimental Course** (3) Snodgrass and Staff
Topic to be announced in *Schedule of Classes*.

Third Group

202 **Motor Learning and Performance** (3) Stallings
Variables of perceptual motor learning and performance; theories, concepts, and models of learning applied to teaching and coaching. (Fall and spring)

205 **Perceptual–Motor Programs: Diagnostic–Therapeutic Techniques** (3) Stallings
Programs of perceptual–motor therapy and their basic assumptions and diagnostic–therapeutic techniques. (Fall)

230 **Advanced Concepts in Motor Development** (3) Snodgrass
Study and practice in techniques of critical observance and analysis of motor behavior throughout the life span, with special emphasis on period from birth to age eight and on the aged. (Spring)

232 **Current Issues in Elementary School Physical Education** (3) Snodgrass
Current philosophy, trends, and research; implications for curriculum, instruction, evaluation. (Spring)

239 **Administration of Therapeutic Recreation Services** (3) Staff
Overview of administrative processes necessary for the development, implementation, and evaluation of therapeutic recreation services for disabled, elderly, and other special populations. Emphasis on administrative compe-

tencies in planning, organization, program development, evaluation, and fiscal management. (Spring)

244 **Therapeutic Recreation Practice** (3) Staff
Professional competencies for delivery of therapeutic recreation services to handicapped populations in clinically oriented settings. Emphasis on client assessment, activity analysis, treatment programming, documentation, and relationship of therapeutic recreation to total rehabilitation goals. (Spring)

245 **Medical Aspects of Disabilities and Handicapping Conditions** (3) Ellis
Etiology, symptomology, and treatment of chronic and traumatic disorders associated with handicapping conditions: implications for programming and facility development as related to therapeutic recreation, adaptive physical education, and other therapies. (Fall)

251 **Theories and Techniques of Leisure Life-Style Planning** (3) Smith
Overview of theories and concepts of leisure counseling, leisure education, and leisure life-style planning. Emphasis on methods and techniques of leisure assessments, program planning for leisure education for special populations in institutional and community settings.

252 **Supervision in Therapeutic Recreation** (3) Smith
Overview of organizational dynamics, group processes, and interpersonal relationships as related to supervision. Theory, discussion, and group experiences in group process and supervisory techniques.

255 **Fitness Evaluation and Exercise Prescription** (3) Paup
Methods and techniques for providing individualized exercise and fitness prescriptions based on measurement and evaluation of physical fitness and health-related variables. Prerequisite: HKLS 150, 164. (Spring)

256 **Sports Medicine** (3) Breen
Theory, practice, and research in diagnostic treatment, rehabilitation, and prevention of sports-related injuries.

257 **Principles and Concepts of Employee Health/Fitness Programs** (3) Swengros
General overview of the employee health/fitness movement in the U.S. and other countries. Public and private health policy implications will be analyzed together with national economic and political trends relating to the subject. Evaluation of model programs, procedures, and current practice.

259 **Exercise, Stress, and Cardiac Rehabilitation** (3) Staff
Applied physiology of exercise and psychological stress in relation to coronary artery disease and myocardial infarction; the principles and practice of rehabilitation of patients recovering from a coronary event (heart attack or heart surgery) by exercise therapy and risk-factor reduction. Prerequisite: HKLS 164. (Fall)

265 **Sports and Politics** (3) Troester
Political analysis applied to sports policy; comparative approach to the study of the relationships between ideology, economic development, and the types and levels of government involvement in sports policy.

270 **Philosophic Foundations of Dance** (3) Johnson
Examination and discussion of aesthetic theories in the arts and dance as a performing art, with application to criticism. (Spring)

271 **Dance Reconstruction** (1 to 3) Staff
Recreating the structure and dynamics of movement from dance scores. (Fall and spring)

273 **Advanced Choreography** (3) Withers
Group or solo choreography. Course work includes responsibility for auditions, rehearsals, and presentation in concert. May be repeated once for credit. Prerequisite: HKLS 144 or equivalent. (Fall)

276 **Dance in Society** (3) Johnson
Anthropological aspects of dance; emphasis on current research and literature. (Fall, even years)

280 **Advanced Workshop** (1 to 3) Snodgrass and Staff
Workshops with emphasis on contemporary issues and problems; development of advanced professional competencies. May be repeated for credit with permission of advisor. (Fall and spring)

282 **International Experiences** (1 to 6) Snodgrass and Staff
May be repeated for credit with approval of advisor.

283 **Practicum** (3 to 6) Snodgrass and Staff
Field work, internship, and/or instructional practice, including conference and/or seminar. May be repeated once for credit with permission of advisor. (Fall and spring)

290 **Advanced Seminar** (1 to 3) Snodgrass and Staff
May be repeated for credit with approval of advisor. (Fall and spring)

293 **Independent Study** (1 to 6) Snodgrass and Staff
May be repeated for credit with approval of advisor.

297 **Advanced Topical Studies** (3) Snodgrass and Staff
Independent research and study pertinent to the needs of the student. Prerequisite: Educ 295 or permission of instructor. (Fall and spring)

299 **Thesis Research** (6) Snodgrass and Staff

HUMANITIES

Committee on the Humanities
O.A. Seavey *(Coordinator)*, D.A. Altshuler, J.F. Burks, R.P. Churchill, M.V. Dow, E. Fisher, J. Gold, R.A. Hadley, R.G. Jones, R.W. Kenny, J.D. Moreno, J.A.A. Plotz, J.A. Quitslund, D.D. Wallace, J.E. Ziolkowski

Columbian College of Arts and Sciences offers a set of interdisciplinary courses designed to provide a coherent introduction to classic works in the humanities. The courses deal with historical figures, creative works of art and literature, systems of philosophy, and religious traditions that are the common property of educated people. The full interpretation of these fundamental sources of Western culture requires the collaboration of faculty from all disciplines of study encompassed in the humanities.

Columbian College students may use up to 6 semester hours of these courses toward the fulfillment of the meaningful initiation requirement in the humanities.

1 **Roots of the Western Tradition** (3) Staff
Basic ideas of Western thought from early Greek, Roman, Judaic, and Christian traditions. Representative readings in drama, epic, historical writings, oratory, creation stories, scriptural traditions, philosophy, and spiritual autobiography. To be taken in conjunction with Engl 13. (Fall and spring)

2 **Ideas in Western Culture: Aquinas to Voltaire** (3) Staff
An examination in historical context of central texts from the Middle Ages, the Renaissance, and the Enlightenment: Aquinas, Dante, Machiavelli, Erasmus, Luther, Montaigne, Bacon, Shakespeare, Rabelais, Descartes, Milton, Locke, and Voltaire. (Spring)

3–4 **Studies in 19th-Century Culture** (3–3) Plotz
Through study of representative works of European and American art, music, literature, drama, philosophy, and theology, students are introduced to major themes of 19th-century culture and are initiated into the methods of analysis and interpretation characteristic of the different disciplines within the humanities. The 19th-century resources of Washington form part of the curriculum. (Academic year)

43–44 **Classical Humanities** (3–3)
Lectures in the origins and development of Western civilization from approximately 3000 B.C. to 1300 A.D. Engl 43 considers the civilization of the Old Testament period and of Classical Greece through readings in the Old Testament and in Homer, Aeschylus, Sophocles, Euripides, Aristophanes, Herodotus, Thucydides, Plato, and Aristotle. Engl 44 considers the civiliza-

tion of the Roman Empire and of medieval Europe through readings in Virgil, Tacitus, St. Augustine, Aquinas, and Dante, and in medieval romance. Objective quizzes and one paper. Offered off-campus only.

45–46 **Humanities in the Modern World** (3–3)
Lectures in the development of Western civilization from the 14th to the 20th centuries. Engl 45 considers Renaissance and Neoclassical culture through readings in Machiavelli, Cellini, Shakespeare, Cervantes, Bacon, Moliere, and Voltaire. Engl 46 considers aspects of Romanticism and Modernism manifested in works by Goethe, Flaubert, Zola, Nietzsche, Mann, Chekhov, and Joyce. Objective quizzes and one paper. Offered off-campus only.

INDIVIDUAL GRADUATE PROGRAMS

Committee on Individual Programs
J.J. Cordes *(Program Director)*, B.L. Catron, W.B. Griffith, T.L. Hufford, P.H.M. Lengermann, C.E. Rice

The Graduate School of Arts and Sciences offers the course listed below primarily for students with individualized interdisciplinary programs of study for the master's degrees. The Committee on Individual Programs, which has supervisory responsibility for Individual Programs students, provides the faculty for the Colloquium.

250 **Colloquium on Interdisciplinary Methodologies** (3) Staff
Analysis from several perspectives of the problems inherent in interdisciplinary study and research, conditions that justify interdisciplinary work, norms and strategies for success, and case studies. Required for all students in Individual Programs. Open to other interdisciplinary students with permission of the Colloquium Director. (Spring)

INSTITUTE FOR SINO-SOVIET STUDIES

Members of the Institute
G. Sigur *(Director)*, M. Atkin, C.F. Elliott, A. Gyorgy, H.C. Hinton, W.R. Johnson, Y. Kim, C.A. Linden, C.A. Moser, J. Pelzman, V. Petrov, C. Shih, M. Sodaro, R. Thornton, S. Wolchik, R.Y. Yin

Associate Members of the Institute
J. Banister, J.J. Dziak, J. Hardt, T. Hsia, D.S. Kamerling, W.H. Lewis, B. Ramundo, P.A. Smith, E.L. Warner

The Institute for Sino-Soviet Studies offers specialized graduate study in the School of Public and International Affairs. Students who lack background in Soviet and East Asian studies are required to take undergraduate courses selected by the advisor as prerequisite to graduate work. Related preparatory undergraduate courses include the following: Econ 101, 102, 133, 134, 169, 170; Hist 137, 145, 146, 187, 188, 189, 195, 196; PSc 1, 106, 107, 108, 131, 165, 168, 170, 173.

The objectives and programs of the Institute are stated under the School of Public and International Affairs. For descriptions of the courses listed below, see the appropriate departmental listing.

ECONOMICS

267 *Seminar: Soviet Economy* (3)	Hardt, Pelzman
268 *Seminar: Economic Theory and Development in Communist Countries* (3)	Hardt, Pelzman
269 *Economy of the People's Republic of China I* (3)	Yin
270 *Economy of the People's Republic of China II* (3)	Yin
271 *Economy of Japan* (3)	Staff
281 *International Economics* (3)	Pelzman
367 *Seminar: Soviet Planning in Theory and Practice* (3)	Pelzman

GEOGRAPHY AND REGIONAL SCIENCE

224	*Seminar: Political Geography* (3)	Pederson
265	*Seminar: Geography of the Soviet Union* (3)	Kamerling
266	*Seminar: Geographic Perspectives on Contemporary China* (3)	Banister

HISTORY

205	*Readings Seminar: Evolution of Nationalism in Eastern Europe* (3)	Staff
206	*Readings Seminar: Revolution in Eastern Europe* (3)	Landa
217	*Readings/Research Seminar: Russian and Soviet Thought* (3)	Atkin
232	*Comparative Communist Systems I* (3)	Wolchik
233	*Comparative Communist Systems II* (3)	Wolchik
237	*Readings Seminar: Soviet Foreign Policy, 1917–1964* (3)	Petrov
246	*Readings/Research Seminar: History of Modern Russia and Soviet Union* (3)	Atkin
253–54	*Readings Seminar: History of Sino-Soviet Relations* (3-3)	Thornton
255–56	*Readings Seminar: U.S.–Soviet Strategic Relations Since World War II* (3–3)	Thornton
258	*Communist Party of the Soviet Union* (3)	Sodaro
259–60	*Research Seminar: Problems in U.S.–Soviet–Chinese Relations* (3–3)	Thornton
289	*Readings/Research Seminar: Modern Japanese History* (3)	Sigur
293	*Research Seminar: Modern East Asian History* (3)	Johnson
295–96	*Readings Seminar: Modern East Asian History* (3–3)	Johnson

POLITICAL SCIENCE

207	*Readings in Socialism and Communism* (3)	Elliott, Linden, Wolchik
208	*Readings in Marxism–Leninism* (3)	Elliott, Linden
230	*Comparative Government and Politics I* (3)	Kim, McClintock, Feigenbaum
231	*Comparative Government and Politics II* (3)	Kim, McClintock, Feigenbaum
232	*Comparative Communist Systems I* (3)	Wolchik
233	*Comparative Communist Systems II* (3)	Wolchik
258	*Communist Party of the Soviet Union* (3)	Sodaro
263	*Communism in Non-Communist Europe* (3)	Sodaro
264	*The International Politics of Eastern Europe* (3)	Gyorgy
265	*Governments and Politics of Eastern Europe* (3)	Gyorgy
266	*Readings in Soviet Government and Politics* (3)	Elliott, Linden
267	*Soviet Government and Politics* (3)	Elliott, Linden, Wolchik
268	*Soviet Foreign Policy* (3)	Elliott
269	*Soviet Military Policy and Strategy* (3)	Elliott, Warner
270	*Politics of the People's Republic of China I* (3)	Hinton
271	*Politics of the People's Republic of China II* (3)	Hinton
272	*Foreign Policy of the People's Republic of China* (3)	Hinton
275	*International Politics of the Far East* (3)	Hinton
276	*Governments and Politics of Japan and Korea* (3)	Kim
291	*Colloquium: East Asia* (3)	Hinton
292	*Colloquium: Russia and Eastern Europe* (3)	Gyorgy

INTERNATIONAL AFFAIRS

See **School of Public and International Affairs.**

ITALIAN

See **Romance Languages and Literatures.**

JAPANESE

See **East Asian Languages and Literatures.**

JOURNALISM

Professorial Lecturers F.L. Dennis, C.W. Puffenbarger, J. Coldsmith, G. Cheely, L.B. Laurent
Associate Professors R.C. Willson, P. Robbins *(Chairman)*
Adjunct Associate Professor J. Deakin
Associate Professorial Lecturers J.P. McGill, W.R. Fonda, C. Blount, R.R. Mueller, T.O. Cron, D. Haun, J.R. Fogarty, D.L. Smith, F.G. Graves, E.H. Moore, R.R. Rast

Bachelor of Arts with a major in journalism (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students planning to major in journalism should take Engl 11 rather than Engl 12 in satisfying the English composition requirement.)
2. Prerequisite courses—Engl 51–52 or 71–72; Jour 71–72; PSc 1 and 2.
3. Required courses in the major—24 hours of second-group courses in Journalism, including (a) Jour 111, 196, 198; (b) 9 semester hours chosen from Jour 121, 125, 133, 135, 137, 138, 139, 151, 155; and (c) 6 semester hours chosen from Jour 115, 116, 117, 128, 129, 140, 141, 142, 145, 146, 150, 170, 190, 199.
4. Required as a secondary area of concentration—a minimum of 18 semester hours of second-group courses, chosen in consultation with the major advisor, in one other department or field of study.

Recommended electives: Econ 121, 142, 157, 161, 162, 181–82; PSc 110, 111, 112, 114–15, 116, 118, 119, 120, 122; Psyc 115; CmTr 132, 133, 134, 135–36, 145; Stat 53, 105, 129.

Minor in journalism—The student must complete 21 semester hours in journalism, including Jour 71 or 72; Jour 111; one course selected from Jour 115, 116, 117, or 170; three courses selected from Jour 121, 125, 133, 135, 137, 138, 139, 151, or 155; and any one other journalism course.

Departmental prerequisite: Jour 111 is prerequisite to Jour 115, 125, 133, 135, 137, 138, 139, 190, and 196.

First Group

71–72 **Introduction to Mass Communication** (3–3) Willson
Jour 71: Evolution of newspapers and other media in relation to political, social, and economic life; concept of press freedom. International students who lack knowledge of U.S. history should take Hist 71–72 before taking Jour 71. Jour 72: Mass media, problems of contemporary journalism, emphasis on federal government–media relations. (Academic year)

Second Group

111 **Reporting** (3) Robbins
Gathering, evaluating, and writing news. Typing required. Laboratory fee, $10. (Fall and spring)

115 **Newspaper Editing and Make-up** (3) Coldsmith, Rast
Preparation of news copy, pictures, and other graphic material for publication; evaluation of news; page layouts; newspaper make-up. (Fall and spring)

116 **Magazine Layout and Design** (3) Smith
Layout, typography, and design for magazines, newsletters, house organs, and similar publications for associations, institutions, and industry. (Fall)

117 **Magazine Editing** (3) Graves
The editor's responsibility to publisher and readers. Setting the editorial goals and planning content and production to meet them. Editing copy for general and specialized magazines. (Spring)

Willson

121 **Feature Writing** (3)
Free-lancing nonfiction articles, materials obtained through independent investigation. (Fall and spring)

Staff

125 **Science Writing** (3)
Writing science news for the mass media. (Spring)

Deakin

128 **Government Process and the Media** (3)
Examination of the roles played by the news media that affect the political process, including the impact the media have on the Presidency, the Congress, and the bureaucracy, and the adequacy of news organizations to provide information and analysis needed by citizens to exercise effective self-government. Same as PSc 128.

Staff

129 **TV News: The Politics of Visibility** (3)
Same as PSc 129.

Puffenbarger

133 **Advanced Reporting: Community News** (3)
Coverage and writing of local news. (Fall and spring)

Cron

135 **Advanced Reporting: Consumer Affairs** (3)
Specialized training in the consumer news field. (Fall)

Fogarty

137 **Advanced Reporting: National Affairs** (3)
Coverage and writing of federal government news. (Fall)

Puffenbarger

138 **Investigative Reporting** (3)
In-depth reporting in selected areas of political, economic, and social affairs. Prerequisite: Jour 133 or permission of instructor. (Spring)

Blount

139 **Advanced Reporting: Radio and Television News** (3)
Preparing news and public affairs programs for broadcast media. (Fall and spring)

Fonda

140 **Photojournalism** (3)
Taking and processing photographs for publication, picture selection, cropping, captions. Students must purchase their own film and print paper. Laboratory fee, $54. Students who received credit for Art 23 or 24 cannot receive credit for Jour 140. (Fall and spring)

Haun

141 **Intermediate Photojournalism** (3)
Advanced news and feature photography, editing, layout and photo essays. Students must purchase their own film and print paper. Laboratory fee, $54. Prerequisite: Jour 140 or Art 23 and 24. (Fall and spring)

Staff

142 **Advanced Photojournalism** (3)
Picture stories and photo essays in black and white or color; emphasis on layout, captions, text. Students must purchase own film and print paper. Laboratory fee, $54. Admission by permission of instructor. (Spring)

McGill, Mueller, Moore

145 **Principles and Problems of Public Relations** (3)
Principles, problems, and ethics of public relations for government agencies, commercial establishments, educational and other public institutions. Case histories of successful programs. (Fall and spring)

Staff

146 **Government Information** (3)
Growth of information activities in government and the role of the information specialist. Writing and editing for government information operations. (Spring)

Staff

150 **News Coverage in Washington** (3)
The Washington news beats, channels and sources of news in the nation's capital, uses and abuses of the media. Field trips to local news centers and press briefings.

Robbins

151 **Editorial Writing** (3)
Techniques of editorial writing, conducting the editorial page, function of editorials and columns of news commentary in a free press. (Spring)

Laurent

155 **Critical Writing and Reviewing** (3)
Reviewing and commenting on the arts and entertainment for the mass media. (Spring)

Coldsmith

170 **News Publication Management** (3)
The business side of publishing. Study of the roles of advertising, circulation,

promotion, accounting and administration, and mechanical departments in newspapers and other publications. (Spring)

190 **Internship in Journalism** (3) Staff
Study of a journalistic medium in action by working in a Washington area news office. Admission restricted to senior journalism majors selected by a departmental committee. (Fall and spring)

195 **Documentary Photography** (3) Staff
Same as Art 195. Laboratory fee, $54.

196 **Senior Project** (3) Staff
Open only to journalism majors. Major journalistic effort undertaken in consultation with a member of the journalism staff. A written request describing the project must be presented to the staff member for approval and filed with the student's advisor in the semester before registration. (Fall and spring)

198 **Law of the Press** (3) Dennis
Freedom of the press, censorship, legislative controls, publication as contempt of court, copyright, news-gathering agencies, labor law and the newspaper business, law of libel, privileged matter, fair comment on public characters, right of privacy. (Fall)

199 **Special Topics in Journalism** (3) Staff
Selected topics: writing, editing, graphics, photojournalism, or other aspects of communication. May be repeated for credit.

JUDAIC STUDIES

Committee on Judaic Studies
D.A. Altshuler *(Chairman)*, R.H. Davison, R.G. Jones, T.Z. Lavine, B. Nimer, B. Reich, H.M. Sachar, M. Ticktin, H.E. Yeide, Jr., J.E. Ziolkowski

Columbian College of Arts and Sciences offers an interdisciplinary program in Judaic Studies leading to the degree of Bachelor of Arts. This program is intended for students who wish to investigate the history, language, literature, religious and philosophical thought, and political and social experience of the Jewish people from the perspective of several academic disciplines. (Students who wish to concentrate on the religious aspects of Judaism and its relationship to the other religious traditions of the world may prefer to elect a major in religion with an emphasis on Judaism [see Religion].)

Bachelor of Arts with a major in Judaic studies (interdepartmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Clas 21–22, 23–24; Rel 9, 23.
3. Required courses for the major (30 semester hours):
   (a) Clas 103 or 104; Hist 158; PSc 179; Rel 113–14 or 115–16, 213 or 238.
   (b) two meaningfully related courses selected from each of two of the following groups: I—Anth 177, 180; Art 111, 112; II—Clas 100, 101, 102; Engl 175; III—Hist 107, 108, 110, 113, 114, 121, 122, 123, 124, 139, 140, 171, 172, 193, 194, 292, 293, 294; IV—Phil 111, 112, 113, 127, 131, 172; V—Geog 154; PSc 177, 178, 277, 278, 290; VI—Rel 103, 104, 105, 107, 111, 122, 126, 137, 143, 144, 145, 146, 161, 162, 172, 174, 181, 184, 209, 291, 292.

Students applying for the 90-hour degree program in Judaic studies must, in addition to meeting the general requirements stated under Columbian College of Arts and Sciences, present evidence of exceptional preparation in the field of Judaism, provide strong recommendations from high school teachers and/or counselors, and complete a satisfactory interview with the Committee on Judaic Studies.

Minor in Judaic studies—Required: A minimum of 18 semester hours, chosen in consultation with an advisor designated by the Committee on Judaic Studies, from Clas 21–22, 23–24, 25–26, 100, 101, 102, 103, 104; Hist 158; PSc 179; Rel 9, 23, 103, 107, 113, 114, 115, 116, 174, 184, 209, 213, 238.

KOREAN

See **East Asian Languages and Literatures.**

LATIN

See **Classics**

LATIN AMERICAN STUDIES

Committee on Latin American Studies
M. Gordon *(Chairman)*, C. Allen, B.L. Boulier, T.F. Carroll, K.S. Flamm, R.L. Humphrey, Jr., P.F. Klarén, M. Koch-Weser, E. Marasciulo, C. McClintock, T. Morrison, G. Palacios, J.W. Robb, R.L. Seckinger, F.R. Siegel

Bachelor of Arts with a major in Latin American studies (interdepartmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required courses in related areas—Span 1–2, 3–4; or equivalent. (Span 9–10 or equivalent is recommended.)
3. Required courses in the major—(a) Anth 172, 185, or 190; Econ 185; Geog 161; Hist 163–64; PSc 183–84; and 6 semester hours chosen from Span 151–52, 155–56, 157–58, or other approved courses; (b) 18 semester hours, including an interdisciplinary seminar (287) in one of the following areas: anthropology, economics, geography and regional science, Hispanic literatures, history, or political science. The required courses listed in (a) which are in the selected area may be included in computing the required 18 semester hours for (b).

Students may apply for graduation with Special Honors. To qualify, a candidate must fulfill the general requirements stated under Regulations and take a research course in his or her field of concentration, in which an independent study project is completed with distinction.

Minor in Latin American studies—Required: one Latin American course in each of the six member disciplines (anthropology, economics, geography, history, political science, and Spanish-American literature). Two years (or equivalent) of Spanish language is prerequisite.

Master of Arts in the field of Latin American studies—See the School of Public and International Affairs.

Candidates for the degree of Doctor of Philosophy may elect Latin American history as an area of specialization in the field of history, Spanish American literature as an area of specialization in the field of Romance languages and literatures, or politics of Latin America as an area of specialization in the field of political science.

Courses Dealing with Latin America:

Anthropology—115, 170, 172, 185, 190, 215, 262, 268, 272, 282, 287
Economics—185, 233, 234, 251, 252, 265–66, 267, 290, 291
Geography and Regional Science—127, 133, 161, 223, 250, 261, 287, 290, 291
History—161, 162, 163–64, 165, 166, 261, 262, 287
Political Science—183, 184, 283, 284, 285, 289
Portuguese—31–32
Spanish—91–92, 151–52, 155–56, 157–58, 253, 255, 256, 261, 264, 266, 287

Center for Advanced Studies of the Americas—See Special Programs, under School of Public and International Affairs.

LEGISLATIVE AFFAIRS—GRADUATE PROGRAM

Academic Director C.J. Deering

The Graduate School of Arts and Sciences offers a program leading to the degree of Master of Arts in the field of legislative affairs. This program focuses on the U.S. Congress with emphasis on the legislative process, American political institutions, and public policy analysis.

Master of Arts in the field of legislative affairs—Prerequisite: a bachelor's degree with a *B* average from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The curriculum of 33 hours of course work includes the two courses from Group I and two courses each from Groups II, III, and IV. The remaining courses are selected in consultation with the advisor. All students must pass a Master's Comprehensive Examination.

Group I. Legislative Processes
PSc 218 *Legislative Politics* (3)
PSc 234 *Comparative Legislative systems (3)*

Group II. The Processes of Politics
PSc 211 *State and Urban Politics* (3)
PSc 215 *Judicial Policy-making* (3)
PSc 216 *American Presidency* (3)
PSc 217 *Bureaucratic Politics* (3)
PSc 219 *American Political Parties and Electoral Behavior* (3)
PSc 220 *Public Opinion and Political Socialization* (3)
PSc 226 *Issues in Political Economy: The Economic Policy Process* (3)
PSc 286 *Selected Topics in American Politics* (3)

Group III. Public Policy Analysis
PSc 212 *State and Urban Policy Problems* (3)
PSc 222 *Government, Science, and Technology* (3)
PSc 224 *Domestic Policy Analysis—Selected Topics* (3)
PSc 225 *Issues in Political Economy: Economic Policy Analysis* (3)
PSc 246 *U.S. Foreign Policy* (3)
PSc 249 *U.S. National Security Policy* (3)
PSc 250 *Foreign Policy Analysis—Selected Topics* (3)

Group IV. Legislative Research and Analysis
PSc 200 *Introduction to Political Analysis* (3)
PSc 203 *Approaches to Public Policy Analysis* (3)

MANAGEMENT SCIENCE

Professors M.M. Wofsey *(Emeritus)*, R.F. Ericson, G.L. Lippitt, D.D. Roman *(Emeritus)*, P.B. Vaill, J. Harvey, W.E. Halal, E.H. Forman
Professorial Lecturers T. O'Connor, Z.A. Shavell, W.J. Wenker, A.S. Adams, J.F. Regan
Associate Professors J.F. McCarthy, Jr., E.K. Winslow *(Chairman)*, W.W. Hardgrave, J.P. Coyne, S. Umpleby, E.W. Hahn, J. Lobuts, Jr., J.H. Carson, L. Graff, J.D. Frame, T.J. Nagy, W.G. Wells, Jr.
Associate Professorial Lecturers C.A. Gruel, R.W. Shirey, G.T. Solomon
Assistant Professor J. Liebowitz

See the School of Government and Business Administration for programs of study leading to the degrees of Bachelor of Business Administration, Master of Business Administration, Master of Science in Information Systems Technology, Doctor of Business Administration, and Doctor of Public Administration.

First Group

58 **Introduction to Information Processing** (3) Liebowitz and Staff
Basic principles, terminology, and methods of computer data processing. Introduction to the use of the computer as a tool through assignments illustrating typical problems encountered in business and government data processing. Assignments involve computer programming in a higher-level language (FORTRAN or BASIC). Laboratory fee.

Second Group

107 **Fundamentals of Behavioral Science** (3) Lobuts, Winslow
Survey of behavioral science research and practice as related to management. Emphasis on the basic human processes that contribute to the functioning of organizations.

119 **Computer Programming for Information Systems** (3) Coyne, Forman
COBOL programming for business and government data processing applications. For students already familiar with basic computer concepts and programming. Emphasis on practical computer applications in accounting and management information systems. Prerequisite: Mgt 58 or Stat 130. Laboratory fee.

120 **Information Systems Development I** (3) Carson, Coyne
Assessment of the systems concept and its relationship to organizational information decision making and management. Concepts and techniques involved in the initial development of new or revised computer-based information systems, e.g., systems analysis and design phases. Modern programming techniques are emphasized. Prerequisite: Mgt 58 and 119 or permission of instructor. Laboratory fee.

121 **Information Systems Development II** (3) Coyne, Carson
A further examination of the information systems development process, including concepts and techniques for assessment, selection, introduction, operation, and maintenance of a newly designed automated information system. Prerequisite: Mgt 58 and 119 or permission of instructor.

122 **Special Studies in Information Systems** (3) Staff
An independent or group-study project in information systems development which may involve faculty-supervised research, a case-study project, or field experience as an intern systems analyst in a local public or private organization. Prerequisite: Mgt 120 and 121 or permission of instructor.

199 **Individual Research** (3) Staff
Assigned topics. Admission by prior permission of advisor. May be repeated once for credit. (Fall and spring)

Third Group

201 **Management of Strategic Issues** (3) Halal, Vaill
(Formerly Issues Management)
An advanced management course designed to explore strategic issues in organizations and management. Current literature and recent research findings will be analyzed. Topics include productivity, social responsibility, government regulations, consumerism, and employee participation. Prerequisite: Mgt 205 or equivalent.

205 **Organization and Management** (3) Vaill, Ericson, McCarthy, Brown, Halal, Loeser
For designated students in the M.B.A. program. Integrative approach to organizational concepts, management principles, philosophy, and theory in public and private organizations. Evolution of management thought, functions, and practices, stressing present management approaches, general systems theory, and contingency management.

206 **Strategic Planning** (3) Halal
The formulation of strategies that enable organizations to adapt to changing

social, technological, economic, and political conditions. Lectures, discussion, and exercises examine strategic planning practices and the environmental changes affecting corporations, government agencies, hospitals, and other major institutions. Students conduct a strategic planning project for an organization. (Spring)

210 **Individual and Group Dynamics in Organizations** (3) Harvey, Lippitt, Winslow, Vaill
For graduate students who wish to improve their skills in dealing with human behavior in organizations. Theoretical and personal understanding of the roles of interpersonal and group dynamics in management. Focus on individuals and groups in various organizational settings. Intensive work-group experience focusing on theory, research, and group analysis.

211 **Current Issues in Organizational Behavior** (3) Winslow
Study of behavioral factors relating to issues such as automation, ethics, interpersonal relations, organizational change, and similar problems. Problems in behavioral science research.

212 **Behavioral Factors in the Process of Change** (3) Harvey, Winslow
Review of research, theory, and practice related to the process of human change. Students are provided the opportunity to apply their learning in various settings and to demonstrate competence in various media. This course emphasizes the relationship between theory and practice.

213 **Organization Development: A Management Function** Lippitt, Harvey, Vaill
An exploration of the literature, culture, values, and skills that will assist a manager, leader, or administrator to carry out the process of organizational development. Emphasis is on direct managerial intervention, although the role of facilitators in the process will also be explored.

214 **Behavioral Factors in Management Consulting** Lippitt, Harvey
(Formerly Consultative Processes in Organizations)
Theories and methods of planning, introducing, and coping with change in management through the helping process. The dynamics of the consulting process includes phases of consultation, power dynamics, interpersonal relationships, and values. Intended both for managers seeking an understanding of the consultative approach to planned change and for persons in staff or consultative roles seeking such skills and understanding.

215 **Conflict Management: Theory, Concepts, and Methods** (3) Lippitt
Exploration of the ways power is used in conflict situations. Students will discuss and experience ways to make conflict a creative rather than a negative experience. Methods of conflict resolution will be practiced. Conflict in the micro (person-to-person) and macro (system-to-system) levels will be explored. Prerequisite: Mgt 210 or permission of instructor.

216 **Cross-Cultural Management** (3) Vaill
This course focuses on the variety of issues and opportunities that arise when managing outside one's own culture. The manager's credibility and effectiveness are assumed to be culture bound to some extent; outside of one's culture, one's actions may not mean what they do within one's culture. Emphasis on the personal level as opposed to the interinstitutional or intercultural levels. Extensive use of student experiences and research. (Fall and spring)

218 **Computer Programming with Business Applications** (3) Forman and Staff
For designated students in the M.B.A. program. Basic principles, terminology, and organization of computer systems. Emphasis on developing a proficiency in the use of higher-level programming language via computer solutions to production management and accounting problems. Laboratory fee.

220 **Quantitative Factors in Administration** (3) Hahn, Forman, Graff, Hardgrave
Survey of quantitative techniques in solution of management problems. Potentials and limitations of mathematical models and proper areas for their application; use of the computer in solving such models. Topics selected

from linear programming, probability, decision-making under uncertainty, queuing and inventory models, simulation, regression. Prerequisite: Mgt 218, 270, or equivalent. (Fall and spring)

221 **Introduction to Probability Theory and Applications** (3) Hardgrave, Hahn, Forman
Introduction to probability theory and its applications in management science and operations research; foundation course for further study of advanced probabilistic methods in operations research. Sample spaces, conditional probability, common distributions, random variables, simple stochastic processes. Prerequisite: Math 42 or 52 or equivalent. (Alternate years)

222 **Mathematical Programming: Techniques and Applications** (3) Hardgrave, Forman, Graff, Hahn
Technical and applied considerations of linear programming and related methods. Mathematical and computational aspects of linear programming. Formulation of linear programming models. Studies of applications of linear programming. Introduction to integer programming, algorithms, and formulations. Prerequisite: Math 42 or 52 or equivalent. Laboratory fee. (Alternate years)

223 **Techniques of Operations Research** (3) Hardgrave, Forman, Graff, Hahn
Survey and introduction to contemporary operations research techniques, including nonlinear programming, dynamic programming, inventory and queuing models, and simulation. Applications of such methods as models of common processes. Prerequisite: Mgt 221, 222. (Alternate years)

229 **Modeling in Applied Operations Research** (3) Hardgrave
Advanced modeling exercises in applied operations research. Prerequisite: Mgt 223 or permission of instructor. (Alternate years)

230 **Administration of Research and Development** (3) Frame
Examination of technological, political, and economic factors affecting the R&D environment; operational aspects; management problems in military, governmental, and industrial organizations; project selection, resource allocation, personnel, planning and control, measurement, and evaluation. (Fall and spring)

231 **Project Management** (3) Frame, Wells
Specialized aspects of project management, including development of requests for proposals; proposal preparation; project selection, management, and costing; and project managers. Project management skills applicable in a variety of organizational settings in which projects are used to accomplish operational objectives. (Fall and spring)

232 **International Science and Technology** (3) Frame
Technology transfer to advanced countries and LDCs; the technological basis of trade; international licensing, patenting and co-production activities; science, technology, and economic development; international comparisons of scientific and technological capabilities; current global issues involving technology; global transfer of military technologies; export controls of technology. (Fall and spring)

233 **Emerging Technologies** (3) Halal, Frame
Exploration of new developments in scientific and technological innovation, including automation, energy, medicine, bioengineering, social science, information technology, states of consciousness, and space. Emphasis on forecasting these technological advances and assessing their economic and social effects. An overarching theme is the role of advancing technology in driving social change. (Fall and spring)

235 **Technological Entrepreneurship and Innovation** (3) Frame
An examination of the legal, organizational, personnel, financial, marketing, and production aspects of establishing and maintaining technology-based ventures. Special attention focuses on patent protection, trade secrets, licens-

ing strategies, financial resources, tax implications, and venture management approaches. Case studies of recent high- and low-technology ventures.

239 **Seminar: Administration of Research and Development** (3) Wells
Individual and/or group in-depth research projects dealing with various phases of research and development management. Topic will vary each time the course is offered according to the emerging technology, current operational problems, and student interest. Prerequisite: 6 to 9 semester hours of research and development management or permission of instructor. (Fall)

240 **Survey of Information Technology** (3) Graff, Carson, Liebowitz
Management-oriented survey of key areas in information technology, including hardware, software, systems development, management, and the computing milieu. Prerequisite: Mgt 218 or permission of instructor. (Fall and spring)

242 **Systems Analysis for Information Systems I** (3) Liebowitz
Systems analysis for the development of a requirements specification for an information system. Topics include data gathering, information flow modeling, data item identification, data file organization, input/output requirements identification, and the identification of other requirements, such as reliability, response time, workload capability, environmental conditions, and training. Prerequisite: Mgt 240. (Fall and spring)

243 **Human Factors in Information Systems** (3) Nagy, Coyne
The user–system interaction that occurs with computerized information systems. The human factors of on-line dialogues, user psychology of computer systems, and various approaches to user–system interaction are considered. Examples of user–system interfaces from a variety of personal computer systems. Emphasis on the development of effective user–system interfaces. Prerequisite: Mgt 240. (Fall and spring)

249 **Seminar: Information Technology** (3) Graff
Current trends in the design and implementation of computer-supported systems; emphasis on current state of the art through discussion with leading experts in the field and analysis of literature. Prerequisite: Mgt 240, 242, 243; or permission of instructor. (Fall and spring)

252 **Information Resources Management** (3) Graff
Concepts and tools for integration of information, management, and organizational systems. Information as a resource, cost and value assessments, budgeting and accounting structures, and evaluation of information as a resource. Prerequisite: Mgt 205, 240, or equivalent.

253 **Security and Privacy of Information Systems** (3) Forman
An advanced course in information technology, emphasizing the philosophies, principles, and practices of security management in and impact of privacy legislation on computer-based systems. Risk assessment, state-of-the-art measures, trends in the information security field, and roles of the various levels of management and technological staff. Prerequisite: Mgt 218 or 240.

254 **Systems Analysis for Information Systems II** (3) Carson, Coyne
An advanced course for M.B.A. students in information systems management only. The transition from requirements to user–system functional design. The user–system dialogue is developed, along with other user-oriented aspects of the system, such as report generation, system operation facilities, and terminal specifications. Prerequisite: Mgt 249.

261 **Introduction to General Management Systems** (3) Ericson, Umpleby
Dynamics of organization and management from a general systems and cybernetics viewpoint. Translation of general management systems research and theory into the world of organizational behavior and management practice. (Fall)

262 **Systems Design for Managerial Effectiveness** (3) Ericson, Umpleby
Building on the introduction and cybernetics concepts in Mgt 261, this course provides a more advanced set of insights into how these ideas are utilized in

building effective organizations in this era of turbulent environments. Prerequisite: Mgt 261. (Spring)

263 **Case Studies and Field Research in GEMSOC** (3) Ericson, Umpleby
Investigation of existing organizational structures and ongoing management processes from a general management systems standpoint. Operational evaluations of firms and agencies, including intercontextual comparative studies. Prerequisite: Mgt 262. (Spring)

264 **GEMSOC Modeling and Simulation** (3) Umpleby, Ericson
Literature review and current practice analysis: modeling and simulation exercises. Continuous and discrete representations: system dynamics, set theory, kinematic graphs, information theory. Prerequisite: Mgt 261. Laboratory fee. (Fall)

265 **Organizational Cybernetics** (3) Umpleby, Ericson
Introduction of a cybernetic model of decision making and a theory of societal evolution, with application to practical problems of institutional design and institutional change

266 **Principles of Cybernetics** (3) Umpleby, Ericson
Basic concepts in cybernetics and systems theory, emphasizing their interdisciplinary nature. Characteristics of systems, strategies for regulating systems, and paradoxes involved in self-regulation. Applications to the social sciences are emphasized.

270 **Mathematics and Statistics for Management** (3) Hahn, Forman, Graff, Hardgrave
For designated students in the M.B.A. program. Mathematical and statistical concepts employed in the solution of managerial problems. Applications of functions, elements of calculus and linear algebra. Introduction to probability, frequency distributions, statistical inference, regression, and correlation. (Fall and spring)

275 **Managerial Statistics I** (3) Forman, Hardgrave
Statistical methods and their applicability to management. Topics include sampling, estimation, hypothesis testing, regression and analysis of variance. The student will learn how to utilize computer software packages in applying the statistical techniques. Prerequisite: Mgt 218 and 270 or equivalent. Laboratory fee. (Fall and spring)

276 **Managerial Statistics II** (3) Forman, Hardgrave
Statistical modeling of management applications. Topics selected from multiple regression, analysis of variance, analysis of covariance, survey design, forecasting, factor analysis, and other multivariate methods. The student will learn how to utilize computer software packages for statistical modeling. Prerequisite: Mgt 275 or permission of instructor. Laboratory fee. (Spring)

280 **Information Systems Development and Application** (3) Nagy, Forman
An advanced course in information technology, emphasizing philosophies, principles, and practices common to the development and application of information systems. Different approaches are studied, case-study materials are evaluated, and the various roles of the technical staff are considered. Prerequisite: M.S. in I.S.T. degree candidacy or permission of instructor. (Fall and spring)

281 **Microcomputer System Architecture** (3) Hahn, Carson, Forman
An in-depth approach to the understanding and use of microcomputer systems. Principles of microcomputers and distinguishing characteristics among various microcomputer systems. Students work individually with the microcomputer system in the laboratory. Prerequisite: M.S. in I.S.T. degree candidacy or permission of instructor. (Spring)

282 **Information Systems and Telecommunications** (3) Carson, Forman
Principles of telecommunications; applications of telecommunications for the transmission of data communications to enhance the flow of information within an organization. Identifying opportunities for applying technology in ways that will support the efforts of an organization. Terminology, hardware

and software considerations, and calculations necessary for the specification and design of telecommunication systems. Prerequisite: M.S. in I.S.T. degree candidacy or permission of instructor. (Fall)

283 **Higher-Level Programming Languages for Information Systems** (3) — Forman
Use of major programming languages in information technology. Topics for each language include syntax and semantics, ease of learning, coding and debugging, documentation standards and maintenance, suitability for particular problem areas and projected users; availability of languages on large-scale through minicomputers. Comparative analysis of these language and conversion problems. Prerequisite: M.S. in I.S.T. degree candidacy or permission of instructor. Laboratory fee. (Fall)

284 **Data Base Systems** (3) — Coyne
An in-depth approach to the understanding and use of the latest techniques for developing and implementing an effective data base system. Topics include data base organization, creation, and maintenance; evaluation criteria; standardization of data base systems; impact of packaged data management systems; and analysis of the state of the art in data base development. Prerequisite: M.S. in I.S.T. degree candidacy or permission of instructor. (Fall and spring)

285 **Workshop in Data Base Systems** (3) — Coyne, Forman
Analysis and solution of complex information problems through commercially available data base systems; development of evaluation methodology, comparison of implementation strategies. Hands-on experience with at least four major commercial systems. Prerequisite: M.S. in I.S.T. degree candidacy or permission of instructor. Laboratory fee. (Fall and spring)

286 **Operating Systems** (3) — Carson
Principles of operating systems; role of the operating system in resource allocation activities inherent in large-scale digital computers. The specialized functions of these systems are defined, and logical requirements of each are specified, including data structuring, multiprogramming, I/O spooling, and job control. Commercial operating systems studied as examples. Prerequisite: M.S. in I.S.T. degree candidacy or permission of instructor. (Fall)

287 **Design of On-Line Information Systems** (3) — Carson, Forman
Introduction to the analysis, design, and implementation of on-line business information systems. Topics include requirements analysis, functional specifications, file design, man–machine dialogue design, response time requirements, user psychology. Prerequisite: M.S. in I.S.T. degree candidacy or permission of instructor. (Spring)

290 **Special Topics in Management Science** (3) — Staff
Experimental offering; new course topics and teaching methods. May be repeated once for credit. Laboratory fee may be imposed, depending on requirements. (Fall or spring)

298 **Directed Readings and Research in Management Science** (3) — Staff
(Fall and spring)

299 **Thesis Seminar** (3) — Staff
(Fall and spring)

300 **Thesis Research** (3) — Staff
(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students. They are offered as the demand requires.

311–12 **Seminar: Public–Private Sector Institutions and Relationships** (3–3) — Staff
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for

structuring public and private institutional arrangements to meet the needs of society. (Academic year)

328 **Seminar: Operations Research** (3) Hardgrave
Special topics and advanced applications in operations research, such as catastrophe theory, Markovian decision processes, or applications of the calculus of variation in economics and finance. May be repeated once for credit. Prerequisite: Mgt 223 or permission of instructor.

365 **Seminar in Cybernetics and General Systems Theory** (3) Umpleby
A review of major literature in the field: sources of general systems and cybernetics concepts in traditional fields; examination of recent advances and contemporary concepts; extension of existing theory into new areas. Emphasis on relevance of concepts to organization management and institutional design. Prerequisite: Mgt 262.

366 **Managing Institutional Transformation in the Microchip Era** (3) Ericson
Modern microchip technologies have created institutional disparities and discontinuities. General systems and cybernetic concepts provide an essential framework for guiding institutional transformation. Topics include origins of human values; sources of institutional change; problems in institutional articulation; potential impacts of microchip technologies on sociocultural, political, and economic structures and processes; general systems, cybernetics, and managed institutional evolution. Prerequisite: Mgt 365.

390 **Philosophical Foundations of Administrative Research** (3) Vaill
Philosophy of science as applied to research in administration. Topics include the nature and current problems of epistemology, the development and role of theories, and the relationship between theory, methodology, and empirical data. (Fall and spring)

391 **Methodological Foundations of Administrative Research** (3) Umpleby
Examination of the process of social science research. Use of models and theoretical frameworks in research; formulation of research questions, hypotheses, operational definitions, research design, sampling methods, and data analysis approaches. Primary emphasis on the development of dissertation proposals. (Spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
May be repeated for credit. (Fall and spring)

MATHEMATICS

Professors D. Nelson, T.P.G. Liverman *(Chairman)*, H. Kenyon, C. Taam, R.L.A. Bari, I. Katz, H.D. Junghenn
Adjunct Professor J. Eftis
Professorial Lecturers Y. Akiyama, A. Heidrich, B.R. McDonald
Associate Professors I.I. Glick, M.P. Lee, E.A. Stone, M.M. Gupta
Assistant Professors R.D. Pandian *(Visiting)*, L. Somer *(Visiting)*
Assistant Professorial Lecturer P. Echeverria
Lecturer T.F. Wolfinger

Bachelor of Arts or Bachelor of Science with a major in mathematics (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Math 31, 32, 33. (Math 30, a prerequisite to Math 31, may be waived upon examination before registration.)
3. Required courses in the major—a minimum of 24 semester hours of second-group courses in mathematics, including Math 106, 121, 123, 139, and 140. It is also strongly recommended that students take French, German, or Russian, and mathematically related courses in such subjects as physics, statistics, economics, and engineering.
4. Undergraduates who want honors status should contact a department advisor for a specific program. Such status may be requested as early as completion of Math 32.

Bachelor of Arts or Bachelor of Science with a major in applied mathematics (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Math 31, 32, 33. (Math 30, a prerequisite to Math 31, may be waived upon examination before registration.)
3. Required courses in related areas:
   (a) Stat 189–90.
   (b) Eighteen semester hours to be selected, in consultation with the department advisor, from social and management sciences, engineering and physical sciences, or computer sciences. At least 12 semester hours must be chosen from one area, and at least 6 semester hours must be chosen from courses numbered 101 or higher. For courses in applied science, civil engineering, electrical engineering, computer science, engineering administration, mechanical engineering, and operations research, see the *School of Engineering and Applied Science Bulletin*.
4. Required courses in the major—a minimum of 24 semester hours of second-group courses in mathematics, including Math 111, 112, 139, 140, 181–82. It is also strongly recommended that students take French, German, or Russian.
5. Undergraduates who want honors status should contact a department advisor for a specific program. Such status may be requested as early as completion of Math 32.

Master of Arts in the field of mathematics—Prerequisite: a bachelor's degree with a major in mathematics from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Students must complete 30 semester hours of approved course work, with or without a thesis, and must pass a comprehensive examination.

Master of Arts or Master of Science in the field of applied mathematics—Prerequisite: a bachelor's degree with a major in mathematics or a related field such as statistics, a physical science, engineering, or economics.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Course work is divided between mathematics courses and courses from one area of application—economics, engineering (civil, electrical, or mechanical engineering; operations research; or engineering administration), physics, statistics, or urban and regional planning. Courses in the chosen area of application are selected in consultation with the relevant department.

Candidates for the degree of Master of Arts must complete 30 semester hours of approved course work, including Math 299–300 *Thesis Research*, and must pass a comprehensive examination. At least 15 semester hours must be in mathematics courses, with no more than 6 hours of these from second-group courses. The remaining courses are chosen from the selected area of application. Theses are jointly supervised by the Department of Mathematics and the department concerned with the area of application.

Candidates for the degree of Master of Science must complete 30 semester hours of course work and must pass a comprehensive examination. At least 15 semester hours must be in mathematics courses, with no more than 6 semester hours from second-group courses. There is no thesis requirement.

Master of Science for Teachers—Prerequisite: A bachelor's degree; at least 12 semester hours or equivalent in mathematics courses, including the equivalent of Math 31; experience in teaching mathematics at the secondary school level.

Required: 30 semester hours of approved second- or third-group mathematics courses, including Math 168.

Doctor of Philosophy in the field of mathematics—Required: the general requirements stated under the Graduate School of Arts and Sciences. The department doctoral program committee, after consultation with the student, will stipulate (1) courses that must be taken to fulfill the 48-semester-hour requirement leading to the General Examination; (2) the two languages, selected from French, German, or Russian, to satisfy the foreign language requirement; and (3) the four areas of study in which the student must prepare for the General Examination. The doctoral program committee will appoint a Director of Research when the student has selected (preferably early in the program) one of the

following research fields for the dissertation: functional analysis (abstract differential equations, functional equations, generalized functions, groups of operators), group representations, linear algebra (matrix theory), logic, measure and integration, ordinary and partial differential equations, theory of numbers, and topology (general topology, analytic topology, topological groups).

Bachelor of Arts in Education and Human Development with a teaching field in mathematics—Prerequisite: the education curriculum; required: the mathematics option and the professional courses stated under the School of Education and Human Development.

First Group

*3 **College Algebra** (3) Katz and Staff
Equivalent to the standard two years of high school algebra with several additional topics. Prerequisite: one year each of high school algebra and high school geometry. (Fall and spring)

*6 **Plane Trigonometry** (3) Katz and Staff
Prerequisite: two years of high school algebra and one year of high school geometry, or Math 3 (or concurrent registration therefor). (Fall and spring)

*9 **General Mathematics I**(3) Nelson and Staff
Logic, sets, foundations of the number system, abstract mathematical systems, groups. (Fall and spring)

*10 **General Mathematics II** (3) Nelson and Staff
Algebra, Euclidean and non-Euclidean geometries, probability and statistics, matrices. (Fall and spring)

30 **Precalculus** (3) Bari and Staff
Set theory, inequalities, basic analytic geometry, functions and relations. Polynomial, trigonometric, logarithmic and exponential functions. Prerequisite: Math 3 and 6; or one and one-half years of high school algebra, one year of high school geometry, and one-half vear of high school trigonometry; or equivalent. Prior to registration, new students must take a placement examination in algebra and trigonometry. (Fall and spring)

31 **Single-Variable Calculus I** (3) Kenyon and Staff
Differentiation and integration of algebraic functions, exponentials and logarithms with simple applications. Arc length. Conic sections. Prerequisite: Math 30 or equivalent.† (Fall and spring)

32 **Single-Variable Calculus II** (3) Kenyon and Staff
Calculus of trigonometric and hyperbolic functions. Techniques of integration. Taylor formula. L'Hopital's rules. Infinite series; polar coordinates; 3-dimensional vectors. Prerequisite: Math 31. (Fall and spring)

33 **Multivariable Calculus** (3) Kenyon and Staff
Vector-valued functions. Partial differentiation. Multiple integrals. Topics in vector calculus. Prerequisite: Math 32. (Fall and spring)

37 **Computer Programming with Calculus** (3) Gupta
Computer programming in conjunction with calculus, leading to a better appreciation of basic concepts, especially infinity and infinitesimals. Fundamentals of FORTRAN or BASIC, limits of functions and quotients, derivatives as limits of quotients. Increments and differentials (e.g., volumes as functions of radii); rates of change, indeterminate forms: definite integrals; trapezoidal rule; areas and volumes.

41 **Calculus for Economists I** (4) Junghenn
Differentiation and integration of algebraic and elementary transcendental functions; marginal analysis for functions of one variable; optimization of functions of one variable applied to economics. Prerequisite: Math 30 or equivalent.† (Fall)

* The School of Government and Business Administration does not accept credit for this course toward the B.B.A.
† Math 30 may be waived as a prerequisite by examination on scheduled dates.

42 **Calculus for Economists II** (4) Junghenn
Elementary linear algebra with economics applications, including input–output models; partial derivatives; multiple integrals; marginal analysis for functions of several variables; optimization of functions of several variables applied to economics; infinite series. Prerequisite: Math 41. (Spring)

*51 **Mathematics for the Social and Management Sciences I** (3) Glick and Staff
Solution of systems of linear equations; notion of function; graph of function; sequences; differential calculus of functions of one variable; exponential and logarithmic functions. New students must take a placement examination in algebra prior to registration. (Fall and spring)

*52 **Mathematics for the Social and Management Sciences II** (3) Glick and Staff
Integral calculus of functions of one variable; functions of several variables; partial derivatives, maxima and minima, Lagrange multipliers; matrix algebra, linear programming; difference equations and mathematics of finance. Prerequisite: Math 51. (Fall and spring)

Second Group

101 **Introduction to Mathematical Logic** (3) Nelson
Introduction to proof theory and model theory of propositional and predicate calculi, computability, topics from foundations of mathematics. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Fall)

102 **Axiomatic Set Theory** (3) Nelson
Zermelo–Fraenkel set theory, ordinals and cardinals, foundations of the real number system. Prerequisite: Math 101 or permission of instructor. (Spring, odd years, when demand warrants)

103 **Computability** (3) Nelson
Introduction to recursive functions. Various equivalent concepts of computability, numbering computable functions, diagonal method, S-M-N theorem, universal functions, undecidable problems. Church's thesis, recursive enumerability, reducibility and degrees, fixed-point theorems, complexity of computation. Prerequisite: Math 32 or permission of instructor. (Spring)

104 **Mathematics and Human Thought** (3) Staff
Philosophical and historical aspects of mathematics and its interplay with other disciplines from antiquity to modern times. Prerequisite: two years of high school mathematics. (Spring, even years, when demand warrants)

106 **Introduction to Topology** (3) Kenyon and Staff
Prerequisite: Math 139 or permission of instructor. (Spring)

107 **Introduction to Algebraic Topology** (3) Bari
Prerequisite: Math 122 and 139, or permission of instructor. (Fall, even years, when demand warrants)

111 **Mathematics for Engineers and Physicists I** (3) Stone and Staff
Differential equations. Laplace transform. Series solutions of differential equations. Boundary value problems. Prerequisite: Math 33. (Fall)

112 **Mathematics for Engineers and Physicists II** (3) Stone and Staff
Vector analysis. First- and second-order partial differential equations. Topics in complex variables. Prerequisite: Math 111. (Spring)

113 **Graph Theory** (3) Bari
Directed and undirected graphs; bridges, cutpoints, and blocks; connectivity; partitions; Eulerian and Hamiltonian graphs; planarity; coloring problems. Flow charts for computer applications. Prerequisite: Math 32. (Fall and spring)

121–22 **Introduction to Abstract Algebra** (3–3) Lee
Selected topics in elementary number theory, groups, rings (including polynomial rings), and fields. Open to sophomores with permission of

* Social and management science students with a strong record in high school mathematics are advised to take Math 31, 32, and 124 instead of Math 51 and 52. Economics students are advised to take Math 41 and 42.

department. Prerequisite: Math 32 or permission of instructor. (Academic year)

123 **Linear Algebra** (3) Katz
Theory of vector spaces, linear transformations, and matrices. Quadratic and bilinear forms, spectral decomposition. (Fall)

124 **Introduction to Matrix Theory** (3) Liverman and Staff
Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors. Hamilton–Cayley theorem. Systems of linear difference and differential equations. Quadratic forms. Applications to economic, biological, and physical models. Prerequisite: Math 32 or 42 or permission of instructor. (Fall and spring)

125 **Linear Programming** (3) Katz
Simplex algorithm, degeneracy, the assignment problem, duality theorems, post-optimality, the transportation problem, integer programming, applications. Prerequisite: Math 123 or 124, or equivalent. (Offered when demand warrants)

134 **Introduction to Boundary-Value Problems** (3) Gupta and Staff
Prerequisite: Math 111 or 142. (Offered when demand warrants)

135 **Projective Geometry** (3) Staff
Prerequisite: Math 123 or 124, or equivalent. (Offered when demand warrants)

139 **Advanced Calculus I** (3) Junghenn, Taam
Topology of R^n. Continuous mappings. Uniform convergence. Differentiable mappings. Prerequisite: Math 33. (Fall)

140 **Advanced Calculus II** (3) Junghenn, Taam
Contraction maps, implicit function and differential equation theorems. Integration theory. Differential forms. Stokes's theorem. Prerequisite: Math 139 or equivalent. (Spring)

141 **Advanced Calculus III** (3) Glick and Staff
Topics in elementary differential geometry, including vector fields on surfaces, curvature, geodesics, surface area, and Riemannian metrics. Prerequisite: Math 140. (Spring, even years, when demand warrants)

142 **Introduction to Differential Equations** (3) Taam and Staff
Linear and some nonlinear differential equations. Topics include existence theorems, stability, control theory, limit cycles, and applications to physics and ecology. Prerequisite: Math 139 and 123 or 124, or permission of instructor. (Spring)

153 **Introduction to Numerical Analysis I** (3) Gupta and Staff
Accuracy and precision. Linear systems and matrices. Direct and iterative methods for solution of linear equations. Sparse matrices. Solution of nonlinear equations. Interpolation and approximate representation of functions, splines. Prerequisite: Math 33 or equivalent and some knowledge of computer programming. (Fall, even years)

154 **Introduction to Numerical Analysis II** (3) Gupta and Staff
Numerical differentiation and integration. Solution of ordinary differential equations. Introduction to optimization theory, gradient techniques. Least squares and applications, data fitting. Prerequisite: Math 153 or permission of instructor. (Spring, odd years)

157 **Introduction to Complex Variable Theory** (3) Liverman and Staff
Analytic functions. Power series. Contour integration and calculus of residues. Conformal mapping. Physical applications. Prerequisite: Math 139. (Fall)

168 **Seminar: Curriculum Studies** (3) Bari and Staff
Open only to candidates for the degree of Master of Science for Teachers, teachers for in-service training or students recommended by the department of education. Critical examination of secondary school mathematics, curricula, techniques and programs. Prerequisite: Math 31 and permission of instructor. (Offered when demand warrants)

181–82 **Seminar: Applied Mathematics** (3–3) Glick and Staff
Prerequisite: Math 140, Stat 189–90, some knowledge of linear algebra, senior status as major in Applied Mathematics. (Academic year)

191 **Special Topics** (arr.) Staff
Admission by permission of instructor. May be repeated for credit. Offered upon demand.

195 **Reading and Research** (arr.) Staff
Under the personal direction of an instructor. Limited to mathematics and applied mathematics majors with demonstrated capability. Prior approval of instructor required. May be repeated for credit. (Fall and spring)

Third Group
Courses marked with an asterisk (*) are offered every year. Courses listed by title alone are offered when, and with such contents, as demand warrants.

ALGEBRA

201–2 **Modern Algebra I and II** (3–3) Katz, Lee
Fundamental concepts of groups, rings, and fields. (Academic year)

203 **Modern Algebra III** (3) Katz
(Fall)

204 **Representation Theory** (3) Lee

205 **Matrix Theory** (3) Katz
Topics to be chosen from generalized inverses of matrices and their applications to solutions of equations and to LP problems; positive definite matrices and their applications; Riemann matrices; linear groups; quadratic forms and Hilbert's eleventh problem; numerical range of linear operators. (Spring)

206 **Topics in Algebra** (3) Staff

ANALYSIS AND APPLIED MATHEMATICS

*211 **Complex Analysis I** (3) Glick and Staff
Topology of complex numbers; elementary functions; integrals; Cauchy's theorem; maximum modulus and Liouville theorem; Taylor and Laurent series; classification of singularities; contour integration; the residue theorem; continuation, multivalued functions, and branch points. Prerequisite: advanced calculus. (Fall)

212 **Complex Analysis II** (3) Junghenn and Staff
Harmonic functions, partial fractions, Mittag-Leffler theorem; entire functions, the Hadamard product theorem, the gamma function, Hurwitz's theorem, normal families of functions. The Riemann mapping theorem, analytic continuation, Riemann surfaces. Prerequisite: Math 211 or equivalent. (Spring, even years, when demand warrants)

213 **Applications of Complex Analysis** (3) Liverman and Staff
Topics chosen from potential theory and conformal mapping, special functions, asymptotic expansions; steepest descent, stationary phase, and WKB methods. Fourier and Laplace transforms, Wiener–Hopf method, dual and singular integral equations. Prerequisite: Math 211 or an undergraduate course in complex variables. (Spring, odd years, when demand warrants)

*214 **Measure and Integration Theory** (3) Junghenn and Staff
Lebesgue measure and integration in abstract spaces. Probability measures. Absolute continuity; Radon–Nikodym theorem; measure on product spaces; Fubini theorem. L^p spaces. Prerequisite: advanced calculus. (Spring)

*215 **Introduction to Functional Analysis** (3) Taam
Topological and metric spaces; Tychonoff theorem; completion of a metric space; normed and Banach spaces; linear functionals and operators; Hahn–Banach theorem; principle of uniform boundedness; the closed-graph theorem and interior mapping principle; Hilbert spaces, eigenvalues, eigenvectors, invariant subspaces, and projection operators; operational calculus of functions defined on the spectrum. Prerequisite: advanced calculus. (Fall)

216 Banach Algebras and Special Theory of Operators (3) Taam
Gelfand theory of commutative Banach algebras; function algebras, Stone–Cech compactification; application to the spectral theory of operators, spectral theorem for bounded and unbounded operators. Prerequisite: knowledge of measure and integration, introduction to functional analysis, and Tychonoff and Stone–Weierstrass theorem. (Spring, odd years, when demand warrants)

217 Introduction to Ordinary Differential Equations (3) Taam
First course in ordinary differential equations: existence and uniqueness of solutions; continuity of solutions with respect to initial conditions; properties of linear systems. Prerequisite: advanced calculus. (Spring)

218 Topics in Ordinary Differential Equations (3) Staff

219 Partial Differential Equations (3) Liverman
Classical and modern techniques for the exact and approximate solution of PDEs. Separation of variables, Green's functions, variational methods, Hilbert space methods. Prerequisite: advanced calculus. (Spring, odd years, when demand warrants)

220 Topics in Partial Differential Equations (3) Liverman

221 Calculus of Variations (3) Glick

222 Introduction to Numerical Analysis (3) Gupta
Computer arithmetic and round-off errors. Solution of linear systems and nonlinear equations. Interpolation and approximations. Numerical differentiation and integration. Eigenvalues and eigenvectors. Prerequisite: knowledge of advanced calculus and computer programming. (Fall, odd years)

223 Numerical Solution of Ordinary and Partial Differential Equations (3) Gupta
Initial and boundary value problems for ordinary differential equations. Error propagation, convergence and stability. Finite difference and finite element methods for partial differential equations. Prerequisite: knowledge of differential equations and computer programming. (Spring, even years)

224 Generalized Functions and Operational Methods (3) Liverman

225 Theory of Generalized Functions and Distributions (3) Liverman

226 Control Theory (3) Glick

227–28 Introduction to System Theory (3–3) Staff

229 Mathematical Programming (3) Katz

230 Topics in Analysis (3) Staff

231 Topics in Applied Mathematics (3) Taam
(Spring)

232 Topics in Numerical Analysis (3) Gupta
Topic for 1986: Numerical methods and software. For science and engineering students. Introduction to the methods, tools, and ideas of numerical computation. Emphasis on problem solving using standard mathematical software, such as IMSL subroutines and Math Protran. Interpolation; linear, nonlinear, and differential equations. Prerequisite: matrix theory, differential equations, and FORTRAN programming. (Spring)

241–42 Mathematical Foundations of Stochastic Processes (3–3) Junghenn
(Math 241—spring)

COMBINATORIAL MATHEMATICS

261 Combinatorics (3) Bari
Generating functions, recurrence relations, counting theorems. Selected topics. Applications to statistical mechanics, information theory, design of experiments, operations research, linear and dynamic programming, network theory. Prerequisite: undergraduate modern algebra and linear algebra. (Spring, odd years)

262 Graph Theory (3) Bari
Electrical and other networks, matroids, chemical isomers, crystal structure, linear programming, operations research, Markov chains, Feynman diagrams,

selected topics in graph theory from introductory topics to problems currently of research interest. (Spring, even years)

263 **Topics in Combinatorial Mathematics** (3) Staff

LOGIC

271 **Introduction to Mathematical Logic** (3) Nelson
Propositional and predicate calculus (first order): syntax, formation rules, semantics, axioms, proof and deduction, object vs. metalanguage, deduction theorem, compactness theorem, Gödel–Henkin completeness theorem, Craig's interpolation theorem, Beth's definability theorem. First-order recursive arithmetic; incompleteness and undecidability. (Fall, odd years)

272 **Topics in Logic** (3) Nelson

TOPOLOGY

281–82 **General Topology** (3–3) Kenyon and Staff
General topological spaces, separation axioms, compactness, and connectedness. Metrization, uniform spaces, and complete spaces. (Math 281—spring)

283–84 **Topological Groups** (3–3) Staff

285 **Topological Vector Spaces** (3) Junghenn

287 **Differentiable Manifolds I** (3) Glick
Differentiable manifolds, tangent vectors, submanifolds, imbeddings and immersions, vector fields and differential equations on manifolds, tensors and differential forms, Lie derivatives, orientability. (Fall, even years)

288 **Differentiable Manifolds II** (3) Glick
Manifolds with boundary, integration on manifolds, Stokes's theorem and the divergence theorem, the Brouwer fixed-point theorem, deRham groups, Riemannian manifolds, geodesics, curvature. (Spring, odd years, when demand warrants)

299 **Topics in Topology** (3) Staff
May be repeated for credit.

RESEARCH

*295 **Reading and Research** (3) Staff
May be repeated once for credit. (Fall and spring)

Fourth Group

*398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

*399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

MICROBIOLOGY—GRADUATE PROGRAMS

Professors R. Hugh, L.F. Affronti *(Chairman)*, M. Reich, P.D. Kind
Associate Professor G.V. Stokes

Master of Science in the field of microbiology—Prerequisite: a bachelor's degree with a major in biological or physical sciences from this University, or an equivalent degree. The undergraduate program must have included the following courses or equivalent: BiSc 11–12; Chem 11–12, 151–52, 153–54; Math 30, 31 (31 may be taken concurrently with the graduate program); Phys 1, 2.

Required: the general requirements stated under the Graduate School of Arts and Sciences. A total of 30 semester hours is required, 24 hours of course work and 6 hours of thesis (Micr 299–300). The course work must include Micr 211 (if not taken prior to admission), plus Bioc 221–22, Micr 277–78, and completion of the biostatistics tool

requirement. The remaining academic work should consist of graduate-level courses selected with the approval of the department.

Master of Science in the field of clinical microbiology (supervisory track)—A program offered jointly by the Microbiology and Pathology Departments. Prerequisite: a bachelor's degree in medical technology or in biological or physical science and a minimum of three years of experience, within the last five years, in a clinical laboratory.

Required: the general requirements stated under the Graduate School of Arts and Sciences. This is a nonthesis program requiring a total of 36 semester hours, including Bioc 221–22; Micr 225–226; Path 230, 231, 232; Micr or Path 294; and Stat 127. The remaining academic work should consist of graduate-level courses selected with the approval of the Microbiology and Pathology Departments.

Doctor of Philosophy in the field of microbiology—Required: the general requirements stated under the Graduate School of Arts and Sciences. Candidates must fulfill the tool requirement by completing biostatistics and by either passing a reading knowledge examination in French or German, or completing satisfactorily 6 semester hours in an approved tool option such as electron microscopy. The General Examination covers at least four fields, two of which must be in microbiological disciplines.

Research fields: immunology, pathogenic microbiology (including subdisciplines of bacteriology, parasitology, and mycology), and molecular and cellular biology (including virology, microbial physiology, and genetics).

211 **Microbiology** (3) Staff
Survey of bacteria, viruses, rickettsiae, fungi, parasites, and immunological concepts. Prerequisite or concurrent registration: Bioc 221–22, or other biochemistry course, and permission of instructor. (Fall)

212 **Pathogenic Bacteriology** (3) Hugh
Principles of pathogenic bacteriology. Isolation and identification of bacterial agents that cause diseases in humans. Pathogenic characteristics of bacteria. Prevention and control of bacterial diseases in humans. Prerequisite: Micr 211 or equivalent; Bioc 221–22. Laboratory fee, $20. (Spring)

213 **Bacterial Pathogenesis** (3) Hugh
Development of bacterial diseases in humans. Prerequisite: Micr 212 or equivalent. (Fall)

214 **Tissue Cell Culture** (3) Bradlaw*
Fundamental aspects of tissue culture, with emphasis on mammalian cells. Specialized techniques and applications of cell culture procedures, emphasizing quality control practices. Prerequisite: Micr 211 or equivalent. (Spring)

215 **Parasitology** (2) Turner†
Study of host–parasite relationships. Clinical recognition of important parasites in medicine. (Fall)

219 **Scientific Writing** (1) Hugh
A basis for preparing theses, dissertations, and publications. (Fall)

225 **Microbial Physiology I** (3) Reich, De Giovanni-Donnelly‡
Microbial structure, nutrition, transport, growth, genetics, metabolism, and regulatory mechanisms. Prerequisite: Bioc 221–22, Micr 211, or equivalent. (Fall)

226 **Microbial Physiology II** (3) Reich, De Giovanni-Donnelly
The actions of antimicrobial agents and antibiotics on the structure and biochemistry of microorganisms at the cellular and molecular level. Prerequisite: Micr 225 or permission of instructor. (Spring)

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* June Adeline Bradlaw is Adjunct Associate Professor of Microbiology in the G.W.U. School of Medicine and Health Sciences.
† Virginia M. Turner is Adjunct Assistant Professor of Parasitology in Microbiology in the G.W.U. School of Medicine and Health Sciences.
‡ Rosalie Frances De Giovanni-Donnelly is Adjunct Professor of Microbiology in the G.W.U. School of Medicine and Health Sciences.

227 **Microbial Physiology Laboratory** (2) Reich
The application of laboratory techniques and instrumentation to topics covered in Micr 225 and 226. Prerequisite: Micr 226. Laboratory fee, $20. (Fall)

229 **Immunology** (3) Kind, Affronti
Lecture course. Fundamental immunologic concepts. Antigens, antibodies, antigen and antibody reactions in vitro and in vivo, and the immune response. Prerequisite: Micr 211 or permission of instructor. (Fall)

230 **Immunology Laboratory** (2) Kind, Affronti
Emphasis on methods in serology, immunochemistry, and cellular immunology that are used in research laboratories. Prerequisite or concurrent registration: Micr 229 or permission of instructor. Limited to students enrolled in a degree program. Laboratory fee, $20. (Fall, odd years)

231 **Immunobiology** (1) Affronti, Kind
Study of immunological functions of reticulo-endothelial tissues, theories of autoimmunity, graft rejection, tumor immunity, delayed hypersensitivities, and immunogenetics. Clinical faculty discuss relevant aspects of immunobiology. For medical students; open to graduate students. Prerequisite: Micr 201* or 229, and permission of instructor. (Fall)

233 **Virology** (3) Stokes
Biochemical, genetic, and pathogenic characterization of viruses. Prerequisite: Micr 211 or equivalent. (Fall)

234 **Virology Laboratory** (2) Stokes
Laboratory complement to Micr 233. Prerequisite or concurrent registration: Micr 233. Laboratory fee, $20. (Fall)

235 **Systematic Bacteriology** (2) Hugh
History of bacterial classification, international rules of bacterial nomenclature, development of bacterial classification based on relationships, characteristics of bacterial groups. Prerequisite: Micr 212 or equivalent. (Fall, odd years)

250 **Pathogenesis of Microbial Infections** (1) Hugh
Physiological, anatomical, pathological, genetic, and biochemical bases for the pathogenesis of selected bacterial, mycotic, viral, and parasitic infections in humans. Host and agent factors that specifically influence resistance to infection. For medical students, open to graduate students. Prerequisite: Micr 201 or 212 and 213. (Fall)

252 **Medical Parasitology** (1) Turner
Lecture and laboratory course. The life cycles, epidemiology, clinical manifestations, pathology, diagnosis, treatment, and prevention of medically important protozoan and helminthic infections. In the laboratory, emphasis is placed on the recognition and identification of the etiologic agents causing disease through the study of living and preserved specimens. For medical students; open to graduate students. (Fall)

255 **Clinical Virology** (1) Staff
General principles of virology; emphasis on clinical situations. For medical students; open to graduate students. Prerequisite: Micr 201 or equivalent. (Fall)

257 **Experimental Immunochemistry** (3) Affronti
Biochemical and physiochemical characterization of antigens and antibodies. Prerequisite: Bioc 221–22 or equivalent, Micr 229. Laboratory fee, $20. Limited enrollment. (Spring, even years)

258 **Microbial Genetics** (2) De Giovanni-Donnelly
Survey of microbial systems that depict basic concepts of genetic principles. Prerequisite: Micr 211 or equivalent. (Spring)

260 **Cellular Immunology** (1) Kind
Advanced seminars in cellular aspects of the immune response. Content

* For description of Micr 201 see the *School of Medicine and Health Sciences Bulletin*.

differs each time course is offered. May be repeated for credit. Prerequisite: Micr 229. (Spring)

277–78 **Seminar: Microbiology** (1–1) Staff
Required of graduate students. (Academic year)

293 **Special Topics in Microbiology** (arr.) Staff
Selected topics in microbiology. May be repeated for credit. (Fall and spring)

294 **Research in Clinical Microbiology** (3) Staff
Development and/or evaluation of techniques, procedures, or instrumentation related to clinical microbiology. Limited to students in the master's program in clinical microbiology. Offered jointly by the Microbiology and Pathology Departments.

295 **Research in Microbiology** (arr.) Staff
Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

MUSEUM STUDIES—GRADUATE PROGRAM

Committee on Museum Studies
M.S. Shapiro *(Director)*, A.D. Andrews, R.L. Humphrey, M.P. Lader, B. Mergen, C.R. Rose

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degree of Master of Arts in the field of museum studies. This program provides students with a broad background in museum studies, including a variety of specialized approaches to museum work, with concentrations in museum administration, collections management/preventive conservation, and museum programs.

The program is designed primarily to prepare students for general responsibilities involving historical and scientific collections. Students whose principal career interests are in art collections and galleries should apply for candidacy in the program for the Master of Arts in the field of art history, with a concentration in museum training, offered by the Art Department. Students whose career interests are primarily in curatorial positions with ethnographic and archaeological materials should apply for candidacy for the Master of Arts in the field of anthropology, with a concentration in museum training. Students whose career interests are primarily in curatorial positions with historical materials should apply for candidacy for the Master of Arts in the field of American studies, with a concentration in museum training. Students whose career interests are in museum education should apply for candidacy in the program for the Master of Arts in Teaching—Museum Education, offered by the School of Education and Human Development.

Students applying for candidacy in the Museum Studies Program must meet all general requirements for admission to the Graduate School of Arts and Sciences, including a bachelor's degree with a major, or its equivalent, in anthropology, art history, American studies, or natural science. In addition, the student should have taken at least 6 credit hours in each of these fields and at least 9 credit hours in one of them, other than the student's undergraduate major, or must show equivalent preparation.

The Committee on Museum Studies serves the Museum Studies Program in an advisory capacity. Its members are drawn from several departments of the University and from the Smithsonian Institution.

Master of Arts in the field of museum studies—Required: the general requirements stated under the Graduate School of Arts and Sciences. The degree requires a minimum

of 42 hours of course work. At least 15 hours of course work must be in an academic core discipline, for example, American studies, anthropology, biological sciences, geology and paleobiology, public administration, or an appropriate interdisciplinary combination. At least 15 hours of course work must be in museum studies courses in collections management, preventive conservation, museum administration, and museum programs. Six to 12 hours must be in a museum internship in the Washington area or elsewhere. The student must pass a comprehensive examination based on course work and submit a research paper of publishable quality. In addition, the student must fulfill the tool requirement by passing a reading examination in an approved foreign language, an approved course in statistics or computer programming, or other approved courses.

201 **Introduction to Museum Studies** (3) Shapiro
An introduction to the field and literature of museum studies. Topics include types and varieties of museums; governance and organization; history of museums; collections management; conservation principles and practices; programs, exhibition, education; interpretation; research, publications, evaluation; ethics and professionalism.

216 **Collections Management: Selected Topics** (3) Russell, K. Spiess, P. Spiess
General principles of collections management—preservation, storage, maintenance, and documentation. Topics include storage hardware systems, environmental effects on collections, inventory control, registration systems, and data storage and retrieval. Illustrative material varies. (Spring)

265 **The Small Museum: Selected Topics** (3)
Topics will vary. (Fall)

270 **Seminar: Museum Exhibiting** (3) Mahoney
Selected museum exhibiting problems in the social and natural sciences, including methods and techniques of exhibition, problems of museum communication and education. Taught at the Smithsonian Institution. (Fall)

291 **Museum Internship** (3 or 6) Shapiro
Individual work experience in museums of the Washington area and possibly elsewhere. Each student should make arrangements with the Director. Museum internships are supervised by one (or more) member(s) of the cooperating museum staff in the area of museum management, conservation, exhibiting, etc. May be repeated for credit. (Fall, spring, summer)

295 **Directed Research** (3) Staff
Individual research on special topics in the museum field. Topics must be approved by the Director of Museum Studies. May be repeated for credit. (Fall, spring, summer)

297 **Special Topics in the Museum Field** (3) Staff
Topics may include Collections Management: Principles and Policies, Museum Accessibility for Handicapped Persons, and Accounting for Nonprofit Organizations. May be repeated for credit.

Related Museum Studies Courses Offered by Other Departments

CONSERVATION
Art Anth 292: *Introduction to Conservation*
Art Anth 293: *Preventive Conservation Techniques*
Art Anth 212: *Advanced Conservation Techniques*
Anth 295: *Research*

ADMINISTRATION
Art 217–18: *Problems in Museum Work*

MUSEUM PROGRAMS
Art 209–10: *Exhibition and Display Design*
Anth 264: *Seminar: Museum Techniques*
Anth 291: *Anthropology in the Museum*
Educ 311: *Museum Audiences*

INTERNSHIPS

Art 201–2: *Museum Projects*
Art 271–72: *Museum Techniques*
Anth 290: *Advanced Museum Research*
AmCv 251: *Museum Research and Education*
Educ 312: *Internship in Museum Education*

MUSIC

Professors G. Steiner, R. Parris
Associate Professors N.A. Tilkens, R.J. Guenther *(Chairman)*
Associate Professorial Lecturer U.A.W. Grahn
Assistant Professor C.J. Pickar
Adjunct Assistant Professors M. Garst *(Piano)*, J.E. White *(Voice)*, S.K. Kim *(Piano)*, J. Albertson *(Guitar)*, F.B. Conlon *(Piano)*, G.B. Delente *(Piano)*, S. Prussing *(Voice)*, M. Sislen *(Guitar)*
Assistant Professorial Lecturers B. Feinstein, C.M. Dunham
Studio Instructors F. Cohen *(Opera)*, M. Findley *(Violin)*, P. Fischer *(Flute)*, K. Fleming *(Cello)*, P. Gieseler *(Voice)*, E. Guenther *(Organ)*, N.M. Irvine *(Bass)*, S.E. King *(Recorder)*, A. Lee *(Voice)*, L. Lipnick *(Bassoon)*, W.H. Mann *(Flute)*, R.J. Pallansch *(Tuba)*, R. Parnas *(Violin and Viola)*, T. Perazzoli *(Flute)*, B.R. Seidman *(Harp)*, S. Wellman *(Voice)*, R. White *(Oboe)*, W.R. Wright *(Clarinet and Saxophone)*, P.G. Taylor, Jr. *(Trumpet)*, P. Edgar *(Percussion)*, G. Cavallaro *(Guitar)*, S.M. Fearing *(French Horn)*

Bachelor of Arts with a major in music (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Mus 2, 5–6: 6 hours of applied music lessons; a minimum of four semesters in music ensemble groups.
3. Required courses in related areas—12 hours of one foreign language (French, German, or Italian recommended).
4. Required courses in the major—Mus 101, 102, 103, 104, 131–32, 138, 151; 6 additional hours of applied music courses. Students preparing for graduate study or professional concentration in music may elect a further program of specialization in music literature, theory, or applied music. (Music majors must meet departmental requirements for proficiency in piano; all majors are expected to perform regularly in student recitals in accordance with minimum departmental requirements.)

Bachelor of Music—Admission to the Bachelor of Music degree program requires demonstration of special advanced pre-admission training and aptitude. The 129-credit-hour program requires music courses as follows: Mus 2 and 9, 5–6, 101–2, 103–4, 131–32, 138–39, 151, 199; 6 hours of ensemble courses; 12 hours of other applied music courses, 15 hours of additional courses in the area of concentration (theory/composition or applied music); and 9 hours of electives. The general requirements consist of 45 hours of nonmusic courses, including 6 hours each of English composition, humanities, social science, and natural science courses, and 12 hours of a foreign language.

Master of Arts in the field of musicology—Prerequisite: a bachelor's degree with a major in music, or an equivalent degree. Applicants from other institutions must present scores on the Advanced Music Test of the Graduate Record Examinations.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 30 semester hours of course work, including a thesis (6 semester hours).

Master of Music in the field of music theory, music composition, conducting, or applied music—Prerequisite: a bachelor's degree with a major in music or an equivalent degree. Applicants from other institutions must present scores on the Advanced Music Test of the Graduate Record Examination.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The required second- and third-group course work is as follows:

1. *In the field of music theory*—30 semester hours of course work, including a thesis (6 semester hours) demonstrating research ability in theoretical, creative, or analytical techniques.

2. *In the field of music composition*—30 semester hours of course work, including a creative thesis of one composition in large form properly prepared for performance (chamber music, a symphonic form, or a choral work with orchestral accompaniment) with a theoretical, formal, and harmonic analysis of the work.

3. *In the field of conducting*—30 semester hours of course work, including a thesis (6 semester hours) demonstrating research ability in theoretical, creative, or analytical techniques. The requirements also include acceptable public conducting performances.

4. *In the field of applied music*—30 semester hours distributed as follows: (a) 12 semester hours of applied music in the area of concentration; (b) 12 semester hours of music theory and music history and literature courses; and (c) a thesis (6 semester hours). The thesis consists of a public recital and performance before a designated committee (such a recital and performance must be representative of an extensive and well-rounded repertory, performed on a professionally accepted artistic level) and delivery of a historical and analytical lecture on the musical content of the program; demonstrated leadership in an ensemble performance (opera or oratorio for voice); and a written report on some approved theoretical area related to the student's concentration.

Bachelor of Arts in Education and Human Development with a teaching field in music—Prerequisite: the education curriculum; required: the music option and professional courses stated under the School of Education and Human Development.

MUSIC THEORY, HISTORY, AND LITERATURE

First Group

1 **Elements of Music Theory** (3) Staff
Notation, scales, keys, intervals, terms, rhythms, and chord structure. (Fall and spring)

2 **Ear Training I** (3) Pickar
Melodic and harmonic dictation, ear training, sight singing, elementary keyboard harmony. Prerequisite: departmental approval. (Fall)

3 **Introduction to Musical Understanding** (3) Steiner, Guenther
Introductory history of musical styles, related to listening; study of music materials and media. (Fall and spring)

4 **Survey of Music Literature** (3) Steiner
Introductory study of musical forms, structures, and textures; aural analysis of selected literature. (Spring)

5–6 **Harmony** (3–3) Parris
Triads, inversions; chord analysis, construction, and progression; part writing, modulations, altered chords. Prerequisite: Mus 1 and 2 or satisfactory passing of placement examination. (Fall and spring)

7 **Music of Non-Western Cultures** (3) Tilkens
Introductory survey of the basic systems and styles of music in the major cultures of the Eastern Hemisphere and Africa.

8 **History of Jazz** (3) Dunham
Introduction to the styles, composers, and performers of jazz music from its origins to the present. (Fall)

9 **Ear Training II** (3) Pickar
Continuation of Mus 2. (Spring)

Second Group

101–2 **History of Music I** (3–3) Tilkens
Development of music in the Western world from the early Christian era through the Baroque. (Academic year)

103–4 **History of Music II** (3–3) Tilkens
Development of Western music from the Classical period to the present. (Academic year)

109 **Orchestra Literature** (3) Steiner
Survey of the history and styles of orchestra literature, analysis of representative works.

110 **Chamber Music Literature** (3) Steiner
Survey of the history and styles of chamber music literature, analysis of representative works.

121 **The Opera** (3) Feinstein
Survey of the history and styles of opera, analysis of representative works.

125 **Keyboard Music Literature** (3) Tilkens
Survey of the history, style, and major content of the keyboard literature from the 16th century to the present.

131–32 **Advanced Theory** (3–3) Parris
Practice in 18th-century contrapuntal writing and analysis, chorale preludes, inventions, and fugues. Prerequisite: Mus 5–6 or equivalent. (Academic year)

133–34 **Composition** (3–3) Parris, Grahn
(Academic year)

135 **Counterpoint** (3) Parris
Study and practice of 16th-century contrapuntal techniques. (Spring)

137 **Orchestration** (3) Parris
Instrumental scoring. (Fall)

138–39 **Form and Analysis** (3–3) Parris
Analysis of musical forms in representative musical literature. (Academic year)

151 **Conducting** (3) Steiner
Technique of conducting, score reading, rehearsal procedures, analysis, and interpretation of selected musical literature; practice in conducting. (Fall)

160–61 **Electronic Music** (3–3) Grahn
Tape and electronic techniques, synthesizer use, and acoustical principles. (Academic year)

173 **Pedagogy** (3) Steiner
Principles, materials, and methods of teaching in selected areas. (Spring)

175 **Performance Practices in Selected Areas** (3) Garst
An investigation of the problems of accurate interpretation of music of selected periods through the use of historical and modern literature and its application to the actual music. Topic to be announced in the *Schedule of Classes*. (Fall—odd years)

199 **Independent Research** (3) Staff
Under the guidance of an assigned instructor. Open only to qualified music majors. May be repeated for credit. (Fall and spring)

Third Group

203 **Bibliography and Research Methodology** (3) Guenther
(Fall)

205 **Music of the Baroque Period** (3) Tilkens
Study of the musical styles, techniques, and literature from 1600 to 1750. (Spring)

206 **Music of the Classical Period** (3) Tilkens
Study of styles, techniques, and literature from the 18th-century schools through Haydn, Mozart, and Beethoven.

207 **Music of the Romantic Period** (3) Guenther
Study of the musical styles, backgrounds, and literature from Schubert through the 19th century. (Fall)

208 **Music of the 20th Century** (3) — Steiner
The principal schools, techniques, developments, and trends of the 20th century.
231–32 **Composition** (3–3) — Parris
May be repeated for credit. (Academic year)
234 **Seminar: Performance Practices in Selected Areas** (3) — Staff
237 **Seminar: Analytical Studies in Music Theory** (3) — Guenther
(Fall)
238 **Seminar: Analytical Studies in Music History** (3) — Guenther
Spring: Mahler.
239 **Independent Research** (3) — Staff
251–52 **Advanced Conducting** (3–3) — Steiner
(Academic year)
299–300 **Thesis Research** (3–3) — Staff
(Fall and spring)

APPLIED MUSIC

All applied music courses are offered both fall and spring, and may be repeated for credit.

Mus 51, 52, 53, 54, 55, and 153 do not include individual lessons and do not require a supplementary fee. All other applied music courses include individual lessons and require a supplementary fee, as follows:

1. One-semester-hour courses: individual lessons of one-half hour a week, supplementary fee, $75.
2. Two- or three-semester-hour courses: individual lessons of one hour a week, supplementary fee, $150.

Supplementary fees for applied music courses are nonrefundable after the first three weeks of the fall and spring semesters. Supplementary fees are different for courses offered during the summer sessions. Consult the Music Department for details.

The supplementary fee is waived for graduate degree candidates in music and full-time undergraduate music majors.

First Group

Required practice: three hours a week for one-semester-hour courses and six hours a week for two-semester-hour courses.

11 **Piano** (1) — Staff
12 **Piano** (2)
13 **Voice** (1) — Staff
14 **Voice** (2)
15 **Organ** (1) — E. Guenther
16 **Organ** (2)
17 **Violin** (1) — Staff
18 **Violin** (2)
19 **Classical Guitar** (1) — Staff
20 **Classical Guitar** (2)
21 **Viola** (1) — Parnas
22 **Viola** (2)
23 **Cello** (1) — Fleming
24 **Cello** (2)
25 **Bass** (1) — Irvine
26 **Bass** (2)
27 **Flute** (1) — Staff
28 **Flute** (2)
29 **Recorder** (1) — King
30 **Recorder** (2)
31 **Oboe** (1) — R. White
32 **Oboe** (2)
33 **Clarinet** (1) — Wright

34 **Clarinet** (2)
35 **Saxophone** (1) Wright
36 **Saxophone** (2)
37 **Bassoon** (1) Lipnick
38 **Bassoon** (2)
39 **French Horn** (1) Odmark
40 **French Horn** (2)
41 **Trumpet** (1) Taylor
42 **Trumpet** (2)
43 **Trombone** (1) R. Guenther
44 **Trombone** (2)
45 **Percussion** (1) Edgar
46 **Percussion** (2)
47 **Harp** (1) Seidman
48 **Harp** (2)
49 **Tuba** (1) Pallansch
50 **Tuba** (2)
51 **Orchestra** (1) Wright, Pickar
Preparation and performance of orchestral literature. Prerequisite: audition before director. (Fall and spring)
52 **Instrumental Ensemble** (1) Pickar
Chamber ensemble groups approved by audition. (Fall and spring)
53 **Glee Club** (1) Pickar
Preparation and performance of choral literature. Prerequisite: audition before director. (Fall and spring)
54 **Chamber Choir** (1) Pickar
Small vocal groups and chorus participation. Prerequisite: audition before director.
55 **Band** (1) Wright
Concert band, stage band, and brass ensemble. (Fall and spring)
57 **Harpsichord** (1) Garst, Parris
58 **Harpsichord** (2)

Second Group

Departmental prerequisite: audition to meet departmental requirements.
Required practice: six hours a week for 1-semester-hour courses and 12 hours a week for 3-semester-hour courses. In addition, 3-semester-hour courses include master performance classes and recital preparation.

111 **Piano** (1) Staff
112 **Piano** (3)
113 **Voice** (1) Staff
114 **Voice** (3)
115 **Organ** (1) Staff
116 **Organ** (3)
117 **Orchestral Instrument** (1) Staff
118 **Orchestral Instrument** (3)
119 **Classical Guitar** (1) Staff
120 **Classical Guitar** (3)
153 **Vocal Theater Workshop** (1) Cohen, Conlon
A performance-oriented program for singers of various vocal abilities. May be repeated for credit. In the fall semester the stress will be on development of body awareness for the stage, acting improvisations, and character development. Scenes will be chosen (with the approval of the voice faculty) from the opera, operetta, and musical theater repertoire. In the spring semester, musical coaching, use of makeup, and audition preparation will be included. (Fall and spring)
157 **Harpsichord** (1) Garst, Parris
158 **Harpsichord** (3)

Third Group

All courses include supervised ensemble preparation and required concert solo performances.

211 **Piano** (3)
213 **Voice** (3)
215 **Organ** (3)
217 **Orchestral Instrument** (3)

NAVAL SCIENCE

Professor G.E. Fisher *(Chairman)*
Associate Professor P.R. Morin
Assistant Professors M.L. Linver, W.B. Martin, D.L. Simon

Naval Reserve Officers Training Corps Program

The Naval Reserve Officers Training Corps (NROTC) offers young men and women the opportunity to qualify for a full scholarship and a commission in the Navy or Marine Corps. NROTC midshipmen are required to complete the naval science courses and attend weekly laboratory sessions. During the summer, NROTC midshipmen participate in active duty at sea or on shore-based training cruises for approximately four weeks. Upon receiving the baccalaureate and completing the NROTC program, qualified midshipmen are commissioned as ensigns in the Navy or second lieutenants in the Marine Corps. Students may join the NROTC through any one of the following four programs.

Four-Year Scholarship Program—Students enter the NROTC Four-Year Scholarship Program through national competition and are appointed midshipmen in the Naval Reserve. While enrolled, the government provides tuition, fees, uniforms, and an allowance of $100 per month. Upon graduation, students are commissioned with an eight-year active/reserve service obligation and will serve on active duty for at least four years. Scholarship Program students must include courses in calculus, physics, technical electives, and naval science in their degree program and participate in three summer training periods of approximately four weeks each.

Two-Year Scholarship Program—Selection for this program is made through national competition, based on the student's academic record, physical qualifications, and an interview. Application should be made at the start of the spring semester of the student's second year. Selected applicants attend six weeks of instruction at the Naval Science Institute (NSI) at Newport, Rhode Island, during the summer before their third academic year. At NSI, students take courses in naval science, physical fitness, and drill, similar to that required of four-year NROTC students during their freshman and sophomore years. Successful completion of the NSI qualifies the two-year applicants for appointment as midshipmen in the Naval Reserve and enrollment in the NROTC Scholarship Program. Upon acceptance of this appointment, students receive all the benefits and assume all the obligations of midshipmen in the Four-Year Scholarship Program.

Four-Year College Program—Students are enrolled in the Four-Year College Program upon acceptance by the Department of Naval Science. Uniforms are provided, and during their junior and senior years, students receive $100 per month. Students must include courses in mathematics, science, and naval science in their degree program, attend the first class summer at-sea training period, accept a commission in the Naval Reserve or Marine Corps Reserve on graduation with an eight-year active/reserve service obligation, and serve on active duty after graduation for at least three years. After commissioning, application for transfer to the regular Navy or Marine Corps may be made. Midshipmen who complete one term as College Program students, have a satisfactory academic record, and are physically qualified may compete for a scholarship awarded by the Chief of Naval Education and Training.

Two-Year College Program—Application should be made at the start of the spring semester of the student's second year. Selections are made through the Department of Naval Science, based on the student's academic record, physical qualifications, and an interview. Those students selected will attend the NSI and upon successful completion

may enroll in the program. The benefits and obligations are the same as for the Four-Year College Program.

Requirements for all candidates—Qualifications for acceptable candidates for the Scholarship Program or the College Program include U.S. citizenship, fulfillment of physical requirements, and willingness to participate in required summer training periods and to accept a commission in the Navy, Marine Corps, Naval Reserve, or Marine Corps Reserve when offered.

Enrollment in NROTC is not a requirement for taking naval science courses. Any student enrolled at George Washington University may take naval science courses with the approval of the Professor of Naval Science.

Degree Credit for Naval Science Courses

Columbian College—NSc 126, 160, and 180 are acceptable as history electives. Up to 12 credit hours (for NSc 52, 150, 175, and 176) may be accepted as professional electives in Columbian College.

School of Education and Human Development—NSc 126, 160, 175, 176, and 180 may be accepted for social science elective credit in the following undergraduate programs: elementary education, secondary education, human services, and special education. All naval science courses are acceptable as elective credit in the travel and tourism and exercise and sport programs.

School of Government and Business Administration—NSc 175 and 176 may be used as equivalents for BAd 191 and 110, respectively, by students in both the B.B.A. and B.Acct. degree programs. For B.B.A. students, any other naval science courses may be used to fulfill science, social science, or elective requirements. For B.Acct. students, any one of the remaining naval science courses may be used to fill an elective requirement.

School of Public and International Affairs—NSc 126, 160, and 180 may be used as elective credit in all six SPIA undergraduate programs.

51 **Introduction to Naval Science** (2)
Structure, principles, and practices; lines of command and control; logistical organizations; functions and services of major components of the Navy and Marine Corps; shipboard organization.

52 **Naval Ship Systems I** (3)
Types, structure, and purpose of naval ships; compartmentation, propulsion systems, auxiliary power systems, interior communications, ship control, ship design and stability.

125 **Naval Ship Systems II** (3)
Theory and principles of operation of naval weapons systems, including types of weapons and control systems, capabilities and limitations, theory of acquisition, identification and tracking, trajectory principles, and the basics of naval ordnance.

126 **Sea Power and Maritime Affairs** (3)
Sea power and maritime affairs; general concept of sea power (including Merchant Marine); role of naval warfare components used to support the Navy's mission; sea power as an instrument of national policy; comparative study of U.S. and Soviet strategies.

150 **Navigation and Naval Operations I** (3)
Theory, principles, and procedures of ship navigation. Topics include mathematical analysis, spherical triangulation, practical work involving sight reduction, sextants, publications, required logs/reports, piloting, celestial and electronic navigation techniques.

151 **Navigation and Naval Operations II** (3)
Principles and procedures of ship movement and employment, including tactical formations and dispositions, relative motion, communications, sonar and radar search and screening theory, rules of the road, lights, signals, and navigation aids.

160 **Evolution of Warfare** (3)
Historical development of warfare. Impact of major military theorists, strate-

gists, tacticians, and technological developments. Strategy, military alternatives, and the impact of historical precedent on military thought and actions.

175 **Naval Leadership I** (3)
Principles of leadership and management. Development of skills in the areas of communications, counseling, control, direction, management, and leadership.

176 **Naval Leadership II** (3)
Human resource management, naval personnel management, material management, and the administration of discipline.

180 **Amphibious Warfare** (3)
Historical development of amphibious doctrine and conduct of amphibious operations. Emphasis on the evolution of amphibious warfare in the 20th century, especially during World War II. Present-day potential and limitations on amphibious operations, including the rapid deployment force concept.

PATHOLOGY—GRADUATE PROGRAMS

Professors H. Sidransky *(Chairman)*, F.N. Miller, S. Bloom, B.C. Zook *(Comparative Pathology)*
Associate Professors S.G. Kent, Y. Al-Doory, C.T. Garrett, J.M. Orenstein
Assistant Professor A.M. Schwartz

Programs of study leading to the degree of *Associate in Science (Medical Laboratory Technique)* and *Bachelor of Science (Medical Technology)* are described in the *School of Medicine and Health Sciences Bulletin*.

Master of Science in the field of clinical microbiology (supervisory track)—A program offered jointly by the Microbiology and Pathology Departments. Prerequisite: a bachelor's degree in medical technology or in biological or physical science and a minimum of three years of experience, within the last five years, in a clinical laboratory.

Required: the general requirements stated under the Graduate School of Arts and Sciences. This is a nonthesis program requiring a total of 36 semester hours, including Bioc 221–22, Micr 225–226; Path 230, 231, 232; Micr or Path 294; and Stat 127. The remaining academic work should consist of graduate-level courses selected with the approval of the Microbiology and Pathology Departments.

Doctor of Philosophy in the field of pathology—Prerequisite: one of the following degrees from a recognized professional school: Doctor of Medicine (M.D.), Doctor of Veterinary Medicine (D.V.M.), or Doctor of Dentistry (D.D.S.). In exceptional cases, applicants with other backgrounds in the life sciences may be accepted. Qualifying scores on the Aptitude Test (Verbal, Quantitative, and Analytical) of the Graduate Record Examination are required. Some students may be required to take the Biology (Advanced Specific Field) examination as well.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 48 semester hours of approved graduate course work. One year of experience in pathology at the University Hospital, equivalent to Path 203, may be counted for a maximum of 24 semester hours of graduate course work. Other experience must satisfy the eligibility requirements of the appropriate national certifying body, i.e., the American Board of Pathology in the case of the M.D., the American College of Veterinary Pathologists in the case of the D.V.M., and the American Board of Oral Pathology in the case of the D.D.S.

Research fields: comparative pathology, human pathology, ophthalmic pathology, veterinary pathology, biochemical pathology, cardiovascular pathology, and nutritional deficiency pathology.

Staff

203–4 **Pathology** (4–4)
General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies. Limited enrollment. Prerequisite to Path

203: Anat 202, 203, 204, 205; or equivalent. Prerequisite to Path 204: Path 203. (Academic year)

220 **Medical Mycology** (2) Al-Doory
Lecture and laboratory course covering pathogenic fungi, mycotic diseases, and their clinical aspects. (Fall)

222 **Opportunistic Mycoses** (2) Al-Doory
Study of the opportunistic fungal infections and their serological, clinical, and therapeutic aspects. Emphasis on identification of fungi and evaluation of laboratory findings. (Spring)

230 **Pathology and Pathophysiology of Infections** (3) Staff
An interdepartmental course dealing with the pathophysiology of human response to injury, with emphasis on, but not restricted to, infectious agents.

231 **Laboratory Supervisory Clerkship** (1) Silver*
Students will rotate through selected clinical microbiology laboratories (hospital, public health, and commercial) to observe the techniques of supervision employed in each setting. Hospital laboratories will range from small community facilities to large medical center facilities. Generally, students will spend a maximum of one week in each laboratory. The type of clerkship a student is required to fulfill will be determined individually, based on past experience. Open only to degree candidates in the clinical microbiology program. (Fall and spring)

232 **Laboratory Management Seminar** (1) Silver
Management techniques related to the clinical microbiology laboratory environment. Open only to degree candidates in the clinical microbiology program. (Fall and spring)

256 **Pathology of Infectious Diseases** (3) Abraham†
Correlation of clinical, physiologic, immunologic, and pathologic mechanisms determining the course and morphological changes that occur in infections. Analysis of human case material and review of assigned selected readings. Prerequisite: Micr 211 and Path 203.

257 **Transmission Electron Microscopy in Pathologic Diagnosis** (3) Orenstein, Abraham
Techniques for the examination and interpretation of ultrastructural changes associated with human disease states. Emphasis on transmission electron microscopy as a diagnostic tool. Prerequisite: Path 203, 204; Anat 260, 261.

258 **Organ System Pathology** (5) Bloom
Gross and microscopic study of human pathologic material reflecting major diseases of specific organ systems. The organ systems studied will be rotated annually, depending on demand. Organ systems to be covered include cardiovascular, digestive, nervous, renal, reproductive, and respiratory. Prerequisite: Path 203, 204, and permission of instructor. (Fall and spring)

276 **Seminar in Experimental Pathology** (1) Staff
Presentations on current topics in experimental pathology. (Fall and spring)

283 **Anatomic Pathology Clerkship** (arr.) Staff
Necropsy and surgical pathology service. Prerequisite: Path 203–4 or equivalent. Five semester hours of credit for each four-week period. Students may receive up to 30 semester hours of credit for six months full-time. Open to limited number of graduate students, with permission.

286 **Perinatal Pathology** (arr.) Kent
Course will focus on the important disorders that may beset the human fetus and the newborn infant. Emphasis on the role of placental abnormalities. Prerequisite: Path 203 or equivalent. (Spring)

* Sylvia Silver is Assistant Professor of Medical Technology in Pathology at the G.W.U. School of Medicine and Health Sciences.
† Andreas Andrew Abraham is Associate Professor of Pathology at the G.W.U. School of Medicine and Health Sciences.

294 **Research in Clinical Microbiology** (3) Staff
Development and/or evaluation of techniques, procedures, or instrumentation related to clinical microbiology. Limited to students in the master's program in clinical microbiology. Offered jointly by the Microbiology and Pathology Departments.

295 **Comparative Pathology** (arr.) Zook, Montali*
Participation in veterinary pathology service, including studies of domestic, wild, and laboratory animals. Review of training materials and participation in training sessions. Graduate students receive 5 semester hours of credit for each four-week full-time period. Prerequisite: Path 203–4.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PHARMACOLOGY

Professors H.G. Mandel *(Chairman)*, V.H. Cohn, P. Mazel, J.A. Straw, P. Klubes, F.P. Abramson, J.R. Williams *(Research)*
Professorial Lecturers J. Axelrod, E. Costa, N.H. Neff, C.-C. Lee
Assistant Professors K.A. Kennedy, L.R. Barrows, D.C. Perry, R.J. Valentino

Master of Science in the field of pharmacology—Prerequisite: a Bachelor of Arts or Bachelor of Science degree. The undergraduate program must have included the following courses, or equivalent: BiSc 11–12; Phys 1, 2; Math 31, 32; Chem 11–12, 22, 151–52, 153–54. A course in physical chemistry is also recommended.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including Bioc 221–22; Phyl 201, 212; Phar 203, 205, 299–300.

Doctor of Philosophy in the field of pharmacology—Required: the general requirements stated under the Graduate School of Arts and Sciences.

Research fields: biochemical pharmacology and toxicology, cancer chemotherapy, developmental pharmacology and toxicology, endocrine pharmacology, molecular pharmacology, neuropharmacology, neurotoxicology, genetic toxicology, cardiovascular pharmacology, pharmacokinetics, pharmacology of drug abuse, and physiological disposition of drugs.

Second Group

114 **Drugs and the Consumer** (3) Cohn and Staff
General concepts of drug action in the body. Action mechanism of some specific prescription and nonprescription drugs, including contraceptives; tranquilizers and sleep-inducing drugs; hayfever, headache, and cold remedies; analgesics; antibiotics; vitamins. Issues related to development and marketing of drugs, drug safety, drug advertising, generic versus trade-name drugs, drug use in sports, drug use during pregnancy, smoking and health. No science prerequisites. Limited enrollment. (Fall)

115 **Nonmedical Use of Licit and Illicit Drugs** (3) Cohn
Psychological and sociological bases of recreational and other nonmedical use of drugs, pharmacological and toxicological aspects of drug action on both the brain and peripheral organ systems, legal and societal implications of and reactions to the nonmedical use of drugs, prevention and treatment of drug dependence. Lectures and discussions on alcohol, narcotics, central

* Richard J. Montali is Adjunct Associate Professor of Pathology (Comparative Pathology) at the G.W.U. School of Medicine and Health Sciences.

nervous system stimulants and depressants, marijuana, hallucinogenic and psychedelic drugs. There are no science prerequisites. (Spring)

158 **Drugs and Their Actions** (2) Abramson and Staff
Introductory pharmacology course. Drugs, the basis of their therapeutic and toxic actions and their fate in the body. Admission by permission of the instructor. (Spring)

Third Group

203 **Fundamental Principles of Pharmacology and Toxicology** (3) Cohn and Staff
Basic principles of pharmacology, including drug receptor interactions, structure activity relationships, pharmacokinetics, membrane phenomena, cellular control mechanisms; mechanisms of mutagenesis, carcinogenesis, teratogenesis, and specific organ toxicity; risk assessment and extrapolation. Admission by permission of the instructor. (Fall)

205 **Pharmacology** (8) Cohn and Staff
Lectures, laboratory, conferences on interaction of drugs and biological systems as a basis of rational disease therapy. Prerequisite: Phar 203, courses in biochemistry and physiology, or approval of department. (Fall)

207 **Cardiovascular Pharmacology** (2) Staff
Physiology and pharmacology of cardiovascular diseases, hypertension, heart failure, coronary artery disease, arrhythmia. Mechanism of action of drugs used in the treatment of cardiovascular diseases. Prerequisite: Phyl 201 and Phar 201, 203, or 205. (Spring)

220 **Molecular Events in Toxic Actions** (2) Staff
Metabolism of xenobiotics to cytotoxic products. Environmental and genetic factors influencing toxic actions. Molecular mechanisms of toxicity. Prerequisite: Phar 203. (Spring)

222 **Genetic Toxicology** (2) Barrows and Staff
The action of chemicals and radiation in the induction of DNA damage and repair *in vitro* and *in vivo* and the sequelae of these processes in cells and mammals. DNA repair mechanisms, mammalian cell toxicity, mutagenesis, and carcinogenesis. Prerequisite: Bioc 221–22. (Spring)

224 **Developmental Toxicology** (2) Staff
The effects of exogenous agents on the process of reproduction and development and their mechanisms of action. Toxic effects on the gametes, embryo, fetus, and neonate. Prerequisite or concurrent registration: Phar 203, 205. (Spring)

226 **Neurotoxicology** (2) Staff
Mechanisms by which chemicals produce toxic effects on nervous tissue at the subcellular, systemic, and behavioral levels. Effects of chronic and acute exposure. Prerequisite or concurrent registration: Phar 203, 205. (Spring, odd years)

230 **Special Topics in Toxicology** (arr.) Staff
Selected aspects of toxicology. Content differs each time the course is offered. May be repeated for credit. (Fall and spring)

254 **Frontiers in Pharmacology** (1) Klubes and Staff
Recent advances and research in pharmacology. Presentations by laboratory scientists from neighboring institutions. (Spring)

258 **Cancer Chemotherapy** (1) Mandel and Staff
Mechanisms by which drugs inhibit the growth of tumor cells. (Spring, even years)

259 **Readings: Cancer and Cancer Chemotherapy** (2) Barrows and Staff
Selected readings and discussion of recent advances in cancer and cancer chemotherapy research. Prerequisite: Phar 201 or 205. (Spring, odd years)

260 **Endocrine Pharmacology** (1) Staff
Lectures and seminars on recent advances in the pharmacology and mechanisms of action of various hormones. (Spring, odd years)

269 **Pharmacology Seminar** (1) Mandel
Recent advances in pharmacology. Content differs each time the course is offered; may be repeated once for credit. (Fall)

272 **Physiological Disposition of Drugs** (3) Cohn
Mechanisms for the absorption, distribution, metabolism, and excretion of drugs and the physical, chemical, and biological factors affecting these processes are studied through extensive reading of classical and current original literature. Prerequisite: Bioc 221–22, Phar 203, or permission of the instructor. (Spring)

273 **Pharmacokinetics: Principles and Applications** (2) Abramson and Staff
A description of compartmental and physiological models of drug disposition. Problem solving to obtain rate constants, organ clearances, etc., from experimental data. Examples of drug disposition exemplifying various pharmacokinetic approaches. (Spring)

275–76 **Advanced Topics in Pharmacology and Toxicology I–II** (1–1) Kennedy and Staff
Lectures and seminars on advances in mechanisms of drug action, pharmacology of new drugs, theoretical aspects of pharmacology, laboratory techniques. (Alternate academic years)

277–78 **Advanced Topics in Pharmacology and Toxicology III–IV** (1–1) Kennedy and Staff
Continuation of Phar 275–76. (Alternate academic years)

279 **Special Topics in Pharmacology** (arr.) Staff
Selected aspects of drug action. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

280 **Neuropharmacology** (2) Perry, Valentino
Fundamental principles. Electrophysiological and biochemical techniques. Neurotransmitters and their pathways in the central nervous system. Drug effects on neurotransmitter pathways. Biochemical basis of mental disease. Prerequisite: Phar 205 or equivalent. (Spring)

295 **Reading and Research** (arr.) Staff
Independent study for students preparing for the Master of Science degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PHILOSOPHY

University Professor P.J. Caws
Professors T.Z. Lavine, R.H. Schlagel, R.S. French, W.B. Griffith *(Chairman)*
Associate Professor R.P. Churchill
Assistant Professors J.D. Moreno, A.W. Urbanas *(Visiting)*

Bachelor of Arts with a major in philosophy (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.)

2. Required courses in related areas—6 semester hours of literature courses selected from Chinese, Classics, English, French, German, Italian, Slavic, or Spanish (Clas 71, 72,

or Engl 191–92 recommended); 6 hours selected from art history, music history, or religion; 6 hours in history (Hist 39–40 recommended)

3. Required courses in the major—a minimum of 30 semester hours, including Phil 111, 112, 113; 9 semester hours selected from Phil 121, 127, 151, 152; 6 semester hours selected from Phil 131, 132, 162; 6 semester hours selected from Phil 172, 192, 193. Recommended electives: Phil 142, 194, plus graduate seminars open to seniors.

For students expecting to continue in graduate school, it is recommended that they include in their program of study 12 semester hours of introductory French, German, or Greek language courses.

Minor in philosophy—Required: a minimum of 18 semester hours, including 6 hours selected from Phil 111, 112, 113 without Phil 50, or 3 hours selected from the same group of courses with Phil 50, plus 12 hours of elective philosophy courses.

Master of Arts in the field of public policy with a concentration in philosophy and social policy—An interdisciplinary program that brings the normative, historical, and analytical-logical skills of philosophical inquiry to bear upon contemporary problems of social policy. Prerequisite: a bachelor's degree from an accredited college or university. Students are expected to have completed the prerequisites to graduate courses.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Two options are available at the discretion of the faculty: (1) a minimum of 24 semester hours of approved graduate course work plus the successful completion of a thesis, or (2) a minimum of 36 semester hours of graduate course work that does not include a thesis. All students are required to take four courses selected from Phil 231, 242, 255, 271, 272; and, for the public policy core, four courses selected from: Stat 111, 183; Econ 217; PSc 203; Psyc 244; Stat 129 or CSci 100 (*Introduction to Computer Science*). Phil 205 is open to all students; it is required of those with insufficient background in philosophy, as determined by the department. Phil 299–300 is required for students electing to write a thesis. Each candidate must pass a Master's Comprehensive Examination based on the particular interdisciplinary composition of the student's program of study. Prospective candidates should consult Professor R.P. Churchill, director of the program.

First Group

45 **Introduction to Logic** (3) Churchill
Deduction, induction, and legal reasoning; emphasis on recognition of fallacies and practical applications of logic. (Fall)

50 **Introduction to Philosophy** (3) Staff
Readings from major philosophers and study of philosophic positions from Plato to Sartre. (Fall and spring)

71 **Philosophy and Literature** (3) Lavine
Philosophical foundations of psychoanalytical psychiatry, existentialism, and Marxism and their expression in literature, e.g., in the works of Mann, Kafka, Camus, Sartre, Hesse, Gide, and Koestler. (Spring)

Second Group

111 **History of Ancient Philosophy** (3) Staff
History of Western philosophy from early Greece to the early Middle ages. (Fall)

112 **History of Modern Philosophy** (3) Churchill
History of Western philosophy of the 17th and 18th centuries (Descartes to Kant). (Spring)

113 **19th-Century Philosophy** (3) Lavine
European philosophy from the Enlightenment and Kant to German Romanticism, Fichte, Hegel, Kierkegaard, Schopenhauer, and Nietzsche. (Fall)

121 **Symbolic Logic** (3) Griffith
Formal evaluation of deductive arguments in politics, law, economics, etc. Additional topics: metatheory of deductive systems; modal logics; logic and

computers. Prerequisite: some knowledge of propositional logic or permission of instructor. (Spring)

127 **Theories of History** (3) Lavine
Major philosophies of history: Judeo-Christian, linear progressive, historicist, Hegelian–Marxian dialectical, cyclical (Vico, Spengler, Toynbee), and social-scientific (Comte, Weber). Contemporary problems of historical knowledge. Same as Hist 127. (Fall)

131 **Ethics: Theory and Applications** (3) Griffith
Main types of ethical theory: egoistic, utilitarian, self-realization, conscience, existentialism. Applications to contemporary problems. (Fall)

132 **Social Philosophy** (3) Staff
Social philosophies from Locke to the Frankfort School, Habermas, and Western Marxism. (Spring)

133 **Philosophy, Nonviolence, and the Problem of War** (3) Churchill
Philosophies of nonviolence; logical and moral problems of nuclear deterrence and national defense; doctrine of just war. (Fall)

135 **Ethics in Business and the Professions** (3) Staff
Basic concepts and theories of ethics for analysis of moral issues arising in business and professional practice. (Spring)

142 **Philosophy of Law** (3) Churchill
Systematic examination of fundamental concepts of law and jurisprudence; special emphasis on the relationship between law and morality. (Fall)

151 **Myth, Science, and the Modern Mind** (3) Schlagel
An overview of the growth of scientific rationalism from its origin in mythopoetic thought to the present, with emphasis on conceptual and methodological developments and the nature of scientific revolutions. Comparison of the cosmological frameworks of Aristotle, Newton, Einstein, and Bohr. (Spring)

152 **Knowledge, Truth, and Reality** (3) Schlagel
Inquiry into the basis and structure of knowledge, the problem of perception and independent reality, the role of language in knowledge, and the meaning and criteria of truth. (Fall)

162 **Aesthetics** (3) Schlagel
The problem of artistic representation and the nature of aesthetic experience as related to the creation, appreciation, and criticism of art. (Spring)

172 **American Philosophy** (3) Moreno
Philosophies of Peirce, Royce, James, Dewey, and Santayana as representatives of American thought. (Spring)

185 **Ethical Issues in Policy Analysis** (3) Griffith
Ethical appraisal of normative policy arguments: cases from current controversies, such as affirmative action programs, campaign contribution limitations, and regulation of worker health and safety.

192 **Analytical Philosophy** (3) Moreno
The dominant movements of recent Anglo-American philosophy—logical positivism, British ordinary language philosophy, and neopragmatism—represented by Russell, G.E. Moore, Wittgenstein, Ryle, Ayer, Goodman, Quine, etc. (Fall)

193 **Phenomenology and Existentialism** (3) Caws
Kierkegaard's existentialist reaction to Hegel; subjectivity and intentionality in 19th-century thought, leading to Husserl's phenomenology; the philosophy of existence in Heidegger and Sartre; the relation between existentialism and Marxism in the later work of Sartre. (Spring)

194 **Structuralism and Hermeneutics** (3) Caws
Structuralism in linguistics (since Saussure), anthropology (Lévi-Strauss), and literary criticism (Barthes and others) and its implications for philosophy (Foucault). The movement will be assessed in relation to other contemporary philosophical trends, especially the hermeneutics of Gadamer and Ricoeur (Fall, odd years)

199 **Readings and Research** (3) Staff
(Fall and spring)

Third Group

201–2 **Readings and Research** (3–3) Staff
Advanced readings and reports. Investigation of special problems. (Academic year)

205 **Selected Schools and Problems** (3) Staff
An advanced review of the rise of modern empiricism, idealism, and pragmatism, with particular attention to controversies regarding problems of method, epistemology, and social and political theory. Recommended for graduate students who have majored in fields other than philosophy. (Fall)

216 **Seminar: Kant** (3) Schlagel
Critique of Pure Reason.

231 **Seminar: Economic Justice** (3) Griffith
(Formerly Ethics and Economic Policy: Justice and Equality)
Ethical and economic analysis of equity and efficiency of current U.S. income distribution patterns. Theories of justice; economic theories of distribution; assessment of redistribution policies. Prerequisite: permission of instructor. (Fall)

235 **Ethics and Business** (3) Griffith
Concepts and strategies of ethical analysis applied to specific business problems, e.g., risk management, plant relocation, preferential hiring, political advertising; development of theory of corporate social responsibility. (Spring)

242 **Philosophy, Law, and Social Reform** (3) Churchill
A philosophical investigation of moral and legal rights in the American tradition, the importance of claims of right and entitlement in policy issues, and the ways legal institutions define specific rights by limiting or giving effect to our duties and liberties. (Spring)

251 **Seminar: Philosophy of Science** (3) Schlagel
Selected topics. (Spring)

252 **Seminar: Epistemology** (3) Schlagel
Critical examination of selected problems or theories of knowledge. (Fall)

255 **Philosophy of the Social Sciences** (3) Moreno
(Formerly Phil 198)
Philosophic issues relating to theory, methodology, and application of the social sciences. (Fall)

271 **Seminar: Nature Esthetics and Landscape Assessment** (3) French
(Formerly Mankind and Nature in Public Policy)
Review of the esthetics of nature, with emphasis on categories for interpreting direct experience of natural beauty rather than expressive representations of nature in art and literature. Analysis of criteria for comparative assessment of landscapes in public policy-making. (Spring)

272 **American Philosophy and Mental Health Policy** (3) Moreno
Analysis and application of philosophical modalities to conceptual problems in mental health care as related to the construction of a social policy.

299–300 **Thesis Research** (3–3) Staff

PHYSICAL EDUCATION

See **Human Kinetics and Leisure Studies.**

PHYSICAL SCIENCE

See **Chemistry.**

PHYSICS

Professors H.H. Hobbs, I. Eisenstein, O. Bergmann, A.J. Zuchelli, F. Prats (*Chairman*), D.R. Lehman, B.L. Berman
Adjunct Professor L.C. Maximon
Associate Professors W.C. Parke, N.K. Khatcheressian, M.F. Taragin, E.P. Harper, A.C. Fonseca (*Visiting*)
Associate Professorial Lecturers J.J. Coyne, N. Khelil, R. Eaton III, M.T. Shams, W.D. Lee, J.W. Lightbody, M. Fatemi
Assistant Professors J.R. Peverley, W.J. Briscoe
Assistant Professorial Lecturers M.I. Haftel, J.T. Broach

Bachelor of Arts with a major in physics (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Phys 13, 14, 15, 16; Chem 11–12; Math 31, 32, 33.
3. Required courses in related area—Stat 107 or CSci 51; Math 111–12.
4. Required courses in the major—Phys 151–52, 161, 162, 163, 164, 165–66, 167, 168, 195.

Bachelor of Science with a major in physics (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Phys 1, 5, 2, 6, 14, 15, 16; Chem 11–12; Math 31, 32, 33.
3. Required courses in related area—Stat 197 or CSci 100; Math 111–12.
4. Required courses in the major—Phys 127–28, 151–52, 163, 164, 195–96; plus one of the following: Phys 161, 165, 167.

For graduation with Special Honors, a student must register for Phys 195 by the beginning of the senior year. The decision to award Special Honors will be based on competence in research and general achievement in physics as evaluated by the faculty.

Minor in physics—Required: Phys 13, 14, 15, 16; Phys 163 and 164 or approved substitutes from 100-level physics courses.

Master of Arts in the field of physics—Prerequisite: a bachelor's degree with a major in physics at this University, or an equivalent degree.

1. The master's degree program *with* thesis—Required: the general requirements stated under the Graduate School of Arts and Sciences, and 30 semester hours of course work in physics, including Phys 211, 212, 213–14, 221–22, 233, 299–300; plus one of the following: Phys 224, 225–26, 231, 243, 244.
2. The master's degree program *without* thesis—Required: the general requirements stated under the Graduate School of Arts and Sciences, and 36 semester hours of course work in physics and mathematics including Phys 211, 212, 213–14, 221–22, 233; plus one of the following: Phys 224, 225–26, 231, 243, 244.

A reading knowledge of a foreign language, or the successful completion of Stat 197 with a grade of *A* or *B*, is a tool requirement.

Doctor of Philosophy in the field of physics—Required: the general requirements stated under the Graduate School of Arts and Sciences, and the successful completion of one of the two following tool requirement options: (a) two foreign language reading examinations or (b) one foreign language reading examination and completion of Stat 197 with a grade of *A* or *B*.

Research fields: nuclear physics—experimental and theoretical studies on the structure, electromagnetic interactions and scattering of few-body systems at low and intermediate energies, and solid-state physics—crystal growth and physical properties of whiskers.

Bachelor of Arts in Education and Human Development with a teaching field in physics—Prerequisite: the education curriculum; required: the physics option and the professional courses stated under the School of Education and Human Development.

Departmental prerequisite for second-group courses—Bachelor of Arts: Phys 13, 14, 15, 16; three semesters of calculus, and consent of a departmental advisor. Bachelor of

Science: Phys 1, 5, 2, 6, 14, 15, 16; three semesters of calculus; and consent of a departmental advisor.

Undergraduate departmental advisors: N. Khatcheressian, W. Parke
Graduate departmental advisors: D. Lehman, F. Prats

First Group

1 **General Physics I** (3) Parke, Peverley
Lecture (2 hours), recitation (1 hour). Development of conceptual principles underlying modern physical knowledge: basics of mechanics, heat, and light, including the classical concepts of energy, momentum, heat, temperature, entropy, and optics. Prerequisite: two years of college preparatory mathematics or concurrent registration in Math 6.

2 **General Physics II** (3) Zuchelli, Eisenstein
Lecture (2 hours), recitation (1 hour). Topics focusing upon present understanding of the physical universe and character of the atomic and subatomic worlds. Includes considerations of electric and magnetic phenomena, relativity theory, wave–particle duality, quantum theory, nuclei, and subnuclear particles. Prerequisite: Phys 1 or equivalent.

5 **General Physics Laboratory I** (1) Bergmann
Laboratory complement of Phys 1 and 21. Two and a half hours. Prerequisite: concurrent or prior registration in Phys 1 or concurrent registration in Phys 21. Laboratory fee, $20.

6 **General Physics Laboratory II** (1) Eisenstein
Laboratory complement of Phys 2 and 22. Two and a half hours. Prerequisite: concurrent or prior registration in Phys 2 or concurrent registration in Phys 22. Laboratory fee, $20.

9–10 **Introduction to Astronomy** (3–3) Hobbs
Lecture (2 hours), recitation (1 hour), laboratory (2 hours). Classical through modern astronomy with introduction to basic principles underlying astronomical systems and observations. Primarily for nonscience majors. Laboratory fee, $15 per semester. (Academic year)

11–12 **Introduction to Astronomy** (2–2) Hobbs
Same as Phys 9–10 without the laboratory. (Academic year)

13 **General Physics for Engineering and Applied Science** (3) Peverley, Briscoe
Lecture (2 hours), recitation and laboratory (2 hours). Development of basic principles of optics and dynamics. Topics include geometrical optics, vector algebra, statics of rigid bodies, hydrostatics, single-particle kinematics and dynamics, conservation of energy. Concurrent registration in Math 31 is required. Laboratory fee, $20.

14 **Mechanics and Thermal Physics** (3) Khatcheressian
Lecture (2 hours), recitation and laboratory (2 hours). Elementary development of mechanics for many-particle systems and basic thermodynamics. Topics include collisions, rotational motion, small vibrations, gravitation, fluid dynamics, wave motion, the ideal gas, the laws of thermodynamics, thermal properties of solids and liquids. Prerequisite: Phys 13; Math 31. Laboratory fee, $20.

15 **Electricity and Magnetism** (3) Taragin, Peverley
Lecture (2 hours), recitation and laboratory (2 hours). Introductory aspects of electromagnetic theory. Topics include static electric fields, Coulomb's Law, Gauss' Law, electrical potential, capacitance and dielectrics, electric current and resistance, Ampere's Law, Faraday's Law, Maxwell's equations in integral form, electromagnetic waves. Prerequisite: Phys 14; Math 31. Laboratory fee, $20.

16 **Modern Physics** (3) Lehman
Lecture (2 hours), recitation and laboratory (2 hours). Elementary approach to the basic principles of quantum theory. Topics include wave–particle duality, the hydrogen atom, Pauli's exclusion principle, x-ray spectra, the atomic

nucleus, radioactivity, nuclear reactions, statistical distribution laws, applications to molecular and solid-state physics. Prerequisite: Phys 14, 15; Math 32. Laboratory fee, $20.

21 **University Physics I** (3) Parke
Lecture (2 hours), recitation (1 hour). Physical concepts and principles are developed using calculus. Topics include classical mechanics, heat, waves, and optics. Concurrent registration in Phys 5 is required. Prerequisite: Math 31. (Fall)

22 **University Physics II** (3) Parke
Lecture (2 hours), recitation (1 hour). Continuation of Phys 21. Topics include electric and magnetic phenomena, relativity, atomic and nuclear physics. Concurrent registration in Phys 6 is required. Prerequisite: Phys 21; Math 32. (Spring)

Second Group

121 **Modern Cosmology** (3) Hobbs
Nonmathematical treatment of cosmology and related subjects from astronomy and physics. Quasars, peculiar galaxies, pulsars, black holes, antimatter, etc. Prerequisite: Phys 10 or 12.

127–28 **Physics in the Life Sciences** (3–3) Parke
Principles of physics applied to biological systems and to medical instrumentation, including ultrasonics, circulation dynamics, bioenergetics, optics in medicine, applications of IR and UV radiation, medical transducers, particle radiation in medicine, models of the brain, molecular biophysics. Prerequisite: Phys 2 or equivalent.

151–52 **Intermediate Laboratory** (3–3) Taragin, Khatcheressian
Independent advanced work to introduce students to research techniques and use of specialized instruments. Laboratory fee, $15. (Fall and spring)

161 **Mechanics I** (3) Prats
Mechanics of mass points and rigid bodies. Newton's laws, conservation laws, Euler's equations, inertia tensor, small vibrations, and elements of Lagrange's and Hamilton's equations.

162 **Mechanics II** (3) Bergmann
Basic aspect of continua, including elasticity and fluid dynamics, strain tensor, stress tensor, equations of equilibrium, elastic waves, ideal and viscous fluids.

163 **Physical and Quantum Optics** (3) Eisenstein
Oscillations and waves, energy and momentum of the electromagnetic field, interference, diffraction, geometrical optics, optics of crystals and other media, dispersion.

164 **Thermodynamics** (3) Parke
Principles and applications of equilibrium thermodynamics, reversible processes, thermodynamic potentials, stability and phase changes.

165–66 **Electromagnetic Theory** (3–3) Zuchelli
Development of Maxwell's field equations using vector and tensor calculus, electrostatics, stationary and nonstationary phenomena, basic circuit theory, electromagnetic waves and radiation.

167 **Principles of Quantum Physics** (3) Harper
Development of logical structure and experimental bases for modern quantum mechanics. Simple examples worked out to clarify the structure; primary emphasis on conceptual framework and its mathematical realization; careful consideration of the laboratory results to which the theory is a response.

168 **Applied Quantum Physics** (3) Harper
Explicit applications of principles of quantum mechanics to a variety of problems in atomic, molecular, and nuclear physics. Quantum statistical mechanics developed with applications in solid state. Emphasis on explicit evaluation of solutions and the techniques required. Prerequisite: Phys 167 or equivalent.

170 **Elementary Solid-State Physics** (3) Khatcheressian, Eisenstein
Structure of solids, lattices and lattice defects, deformation, vibrational and electronic contribution to specific heats, binding energies, electronic states in metals and semiconductors, magnetic properties of solids. Elementary methods required such as quantum mechanics and normal mode expansions are developed as needed.

175 **Nuclear Physics** (3) Lehman, Prats
Introduction to application of quantum physics in the description of nuclei and their interactions. Properties of nuclei, nuclear models, nuclear forces, and nuclear reactions are considered. Specific topics include the deuteron, n-p scattering, the optical model, the shell model, the liquid-drop model, beta decay, fission, and fusion. Prerequisite: Phys 167 or permission of instructor.

195–96 **Undergraduate Research** (3–3) Taragin
Research on problems approved by the staff. For the B.A. option, emphasis will be placed on advanced laboratory experience. For the B.S. option, the two semesters will involve advanced laboratory experience and applications of computers in the solution of physics problems, respectively.

Third Group

Consent of a departmental graduate advisor is required for admission to all third-group courses in physics.

201–2 **Interdisciplinary Science** (4–4) Levy, Merchant, Parke
Joint offering of the Departments of Biological Sciences, Chemistry, and Physics. A treatment of scientific methodology and knowledge, both principles and facts. Designed to provide a basic understanding of the natural sciences and of the nature of science itself. Overview of the known fundamental principles developed in scientific observation of the physical universe. Fundamental principles are applied to systems of increasing complexity, with emphasis on physical, chemical, and biological systems. Students enrolled in natural science programs may not take this course for credit. Prerequisite: high school algebra or equivalent.

211 **Advanced Mechanics** (3) Taragin
Analytic methods of mechanics as a basis for modern theory; variational principles, Lagrange's equations, Hamiltonian formulation, canonical transformations, classical perturbation theory.

212 **Special Relativity** (3) Bergmann
Application of relativistic concepts to the basic fields of physics; space and time, tensors and covariant mechanics of point particles, covariant form of electromagnetism, relativistic variational principles, relativistic quantum equations.

213 **Electromagnetic Theory: Macroscopic Effects** (3) Eisenstein, Harper
Detailed consideration of classical electromagnetic field theory in vacuum and in electrically and magnetically active media. Boundary-value problems, multipole expansions, induced polarizations, time-dependent fields, frame dependence of the fields, gauge transformations, radiation fields.

214 **Electromagnetic Theory: Electrodynamics and Radiative Effects** (3) Eisenstein, Harper
Analysis of problems involved in obtaining the motion of charges in given electromagnetic fields and radiation from such charges. Covariant methods developed and used where suitable. Specific topics include radiation by moving charges, spectral decomposition and integrated flux, angular distribution of radiation, radiation reaction and anomalies.

221–22 **Quantum Mechanics** (3–3) Prats
General aspects of quantum mechanics with emphasis upon the developmental principles involved. Operators, representations, and transformation theory. Schrodinger and Heisenberg pictures, angular momentum, perturbation theory, scattering theory. (Academic year)

224 **Statistical Mechanics** (3) Bergmann
Study of classical and quantum-equilibrium statistical mechanics. Kinetic theory and transport phenomena reviewed prior to examining principles of statistical mechanics. Among topics considered: distribution functions, H theorems, partition functions, Gibb's paradox, canonical ensemble, grand canonical ensemble, ideal gases, interacting gases, cluster expansion, virial expansion, and density matrices.

225–26 **Laboratory** (3–3) Hobbs, Briscoe
Individual work on special topics. Laboratory fee, $20 per semester. (Academic year)

231 **Quantum Electrodynamics: Theory and Applications** (3) Lehman
A presentation of the lower-order effects depending upon the quantal nature of the electromagnetic field: Hamiltonian formulation and field quantization, perturbation calculations, Compton effect, photoelectric effect, electron–electron scattering, pair creation and annihilation, indices of refraction, divergence difficulties.

232 **Quantum Field Theory** (3) Bergmann
Covariant presentation of general theory of quantized fields, Boson and Fermion fields, theory of S matrix, dispersion relations, and renormalization program.

233 **Nuclear Theory** (3) Prats, Lehman, Harper
Nuclear interactions, nuclear models, theory of nuclear reactions, pion physics, and weak interactions.

243 **Solid-State Physics: Structure and Binding** (3) Khatcheressian, Hobbs, Peverley
Atomic structure of solids and analysis of the binding of crystals. Crystalline forms and symmetries, atomic vibrations and specific heats, sound and optical propagation, crystalline defects.

244 **Solid-State Physics: Electronic Processes in Metals** (3) Khatcheressian, Eisenstein
Phenomena in metals and semiconductors determined by the electronic states allowed: binding, specific heats, magnetic properties, transport phenomena. Independent particle approximation and many-body aspects are discussed.

250 **Selected Topics in Modern Physics** (3) Staff
Possible topics include nuclear three-body problem; group theory and symmetry principles in physics; differential manifolds applied to physics; electric states and superconductivity; gauge field theories; dispersion relations and unitarity in scattering theory. May be repeated for credit with permission of graduate advisor. (Fall and spring)

291 **Seminar** (1) Staff
Lectures on special problems in physics. May be repeated once for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated once for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PHYSIOLOGY—GRADUATE PROGRAMS

Professors R.A. Kenney (*Chairman*), M.E. Tidball, M.M. Cassidy, M.J. Jackson
Associate Professors R.A. Lavine, D.W. Watkins
Assistant Professor J.K. Kelleher

Master of Science in the field of physiology—Prerequisite: a bachelor's degree. No major is specified, but the undergraduate program must have included the following courses or their equivalents: BiSc 11–12; Chem 11–12, 22, 151–52, 153–54; Math 31; Phys 1, 2.

Required: the general requirements stated under the Graduate School of Arts and Sciences. In addition to the thesis, the 30 hours of required work include Phyl 201, 205, 212, 221, 298.

Doctor of Philosophy in the field of physiology—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study includes a major field in physiology, a subfield (see below) in physiology, and a supporting field outside of physiology leading to the Cumulative Examination. The 48 semester hours of required course work leading to the Cumulative Examination includes Phyl 201, 205, 212, 221, 298, 396, 397.

Research fields and areas of study: applied physiology, cardiovascular physiology, cellular physiology, endocrine physiology, gastrointestinal physiology, neurophysiology, renal physiology, and respiratory physiology.

Departmental prerequisite: Phyl 201 or equivalent is prerequisite to all courses in physiology numbered above 201, except Phyl 205, 221, and 212.

Second Group

191 **Selected Topics in Human Structure and Function** (3) Kenney
Structural and functional basis of physiology. Required for graduate students who have not had Anat 201 or equivalent; students may receive graduate credit on completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11–12 or equivalent and consent of instructor. Open to Columbian College students with the approval of the major advisor. (Fall)

Third Group

201 **Physiology** (3) Staff
Cellular, organ system, and applied mammalian physiology. Prerequisite for graduate students: Anat 201 or Phyl 191, or equivalent; Bioc 221 or Phyl 205, or consent of chairman of department. Concurrent registration in Phyl 212 is required. Open to Consortium students only with permission of chairman of department. (Spring)

205 **Cell Biophysics** (2) Staff
Lecture (2 hours). An introductory survey of the mechanisms for interconversion and utilization of energy in animal cells. A required course for graduate students intending to take Phyl 201. Prerequisite: BiSc 11–12 or equivalent, and consent of instructor. Open to students in the Columbian College of Arts and Sciences with the approval of the student's major advisor. (Fall)

212 **Neurobiology** (3) Staff
Same as Anat 212. An integrated survey of the structure and function of the human nervous system; lecture, clinical demonstrations, and laboratory. Laboratory fee, $25. (Spring)

221 **Seminar** (1) Cassidy
Staff and student presentations from literature. Present work discussed, experimental design and scientific deduction evaluated. Topics to be announced. Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

253 **Physiology of Fluid Balance and Hydrogen Ion Regulation** (2) Cassidy
Discussion of principles of fluid and acid-base balance and their applications. (Fall)

261 **Gastrointestinal Physiology** (1 or 2) Jackson
Weekly seminar: role of basic sciences in gastroenterology; intra- and extramural speakers. An approved paper required for 2 semester hours of credit. May be repeated for credit. (Fall and spring)

262 **Topics in Cardiovascular Physiology** (2) Kenney
Survey, at an advanced level, of aspects of cardiovascular physiology, especially as interrelated with the respiratory and renal systems. (Fall)

269 **Topics in Neurophysiology and Psychophysiology** (2) Lavine
Selected topics in contemporary neurophysiology, including methods of data collection and analysis, control mechanisms involved in movement and behavior, and sensory processing. Open to students in the School of Engineering and Applied Science with permission of instructor. (Fall)

295 **Research** (arr.) Staff
By special arrangement with individual staff members. Approximately four clock hours in the laboratory for each semester hour of credit. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

298 **Comprehensive Physiology** (5) Staff
Guided review of selected areas of physiology appropriate to the student's graduate program. Prerequisite or concurrent registration: Phyl 221. (Fall)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

396 **Advanced Reading and Research** (2) Staff
Limited to students preparing for the Doctor of Philosophy general examination. Tutorial literature survey of a subfield of physiology and of pertinent areas of the candidate's supporting field. This course satisfies the requirement for Part II of the Cumulative General examination in Physiology. (Fall and spring)

397 **Development of Dissertation Problem** (2) Staff
Limited to students preparing for the Doctor of Philosophy general examination. Preparation for written and oral presentation of dissertation problems. This course satisfies the requirement for Part III of the Cumulative General Examination in Physiology. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

POLISH

See **Slavic Languages and Literatures.**

POLITICAL COMMUNICATIONS

Committee on Political Communications
P. Robbins (*Chairman*), W.C. Adams, R.S. French, S.R. Lichter, J.A. Morgan, W.M. Reynolds, I.R. Thiel, J. Deakin

Columbian College of Arts and Sciences offers an interdepartmental program in political communications leading to the degree of Bachelor of Arts. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. Majors in this field are advised that among the courses listed below, CmTr 49, 133, and 143 can be counted toward fulfillment of the meaningful initiation requirement in the humanities. The prerequisite courses in statistics can be counted toward the requirement in the natural and mathematical sciences.
2. Prerequisite courses.
   (a) Stat 51 or 53 and 105 or 129.
   (b) PSc 1 and 2; Econ 1–2.
   (c) CmTr 1, 133, and 49 or 143 (CmTr 143 and 133 are recommended for the sophomore year).
   (d) Jour 71–72.
   (e) Psyc 1 or 5 or 6, and 151 (Psyc 151 is recommended for the sophomore year)

3. Required courses in the major (45 semester hours):
   (a) PSc 101, 120; three courses chosen from PSc 104, 111, 112, 114, 115, 116, 117, 118, 119, 122, 124, and Hist 134.
   (b) Jour 111; two courses chosen from Jour 137, 139, 145, 146, 150, 151.
   (c) CmTr 134; one course chosen from CmTr 112, 121, 126, 141; one course chosen from CmTr 145, 149, 175, 176.
   (d) PSc/Jour 128, PSc/Jour/CmTr 129, Jour 198, PCm 199.

191–92 **Field Experience** (3–3)
Open to juniors and seniors majoring in political communications. Students will spend at least 12 hours a week during the semester in an approved agency or office performing practical work in the subject under the general guidance of a faculty advisor.

199 **Senior Seminar in Political Communications** (3)
Limited to majors in political communications. Selected reading and discussion with possible field work in the professional subject.

POLITICAL SCIENCE

Professors H.L. LeBlanc *(Chairman)*, B. Nimer, A. Gyorgy, H.C. Hinton, B.M. Sapin, J.A. Morgan, Jr., B. Reich, Y.C. Kim, S.J. Wayne, J.M. Logsdon, W.H. Lewis, C.A. Linden, H.R. Nau, M.A. East
Associate Professors C.F. Elliott, C. McClintock, J.R. Henig, M.J. Sodaro, S.L. Wolchik, R.W. Rycroft, R.C. Rich *(Visiting)*
Assistant Professors C.J. Deering, S.R. Lichter, H.B. Feigenbaum, C.C. Joyner, D.A. Bositis, J.H. Lebovic, W.T. Wander *(Visiting)*

Bachelor of Arts with a major in political science (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite: PSc 1 and 2. Six courses in the social sciences, other than political science, to include 6 hours of history or 6 hours of economics. Twelve semester hours of introductory foreign language and statistics are strongly recommended.
3. Required courses in the major: 30 semester hours of second-group political science courses, including a distribution requirement that consists of 6 semester hours from each of the following groups: Group A (political theory and methodology)—PSc 101, 102, 104, 105, 106, 107, 108, 110; Group B (American government and politics)—PSc 111, 112, 114, 115, 116, 117, 118, 119, 120, 122, 124, 129; Group C (comparative government and politics)—PSc 130, 131, 146, 165, 168, 170, 173, 177, 179, 180, 181, 183, 186; Group D (international politics, law, and organizations)—PSc 140, 142, 144, 149, 161, 178, 182, 184.

Of the courses in Group A at least one must be PSc 101, 102, or 104, and it is recommended that this course be taken as early in the student's academic program as possible.

Every major must complete a proseminar or, if eligible, an Honors Seminar (PSc 196, 197, 198, or 199) in the junior or senior year. A maximum of two of these may be included in a student's program; such courses do not satisfy the department's group distribution requirements. A 200-level course may be substituted for the proseminar requirement with the permission of the instructor and the undergraduate coordinator.

The department also offers a major with a public policy focus. Students who wish to concentrate in public policy must distribute their 30 hours in political science as follows: 3 semester hours from each of Groups A, B, C, D; PSc 104; 9 semester hours in policy-oriented courses to be selected from a group designated by the program advisor; and one policy-oriented proseminar.

Up to 12 hours of either service-learning or internship credit may be applied toward a degree. No more than 6 hours of such courses may be credited toward the major; these courses do not satisfy the distribution requirement.

Students in the 90-semester-hour degree program must receive grades of A in at least 18 semester hours of second-group political science courses.

Students may apply for graduation with Special Honors. To qualify, the student must fulfill the general requirements stated under Regulations and take at least one political science honors seminar in which an independent study project is completed with distinction. The student must complete the seminar before the final semester of course work. The project is evaluated by a Departmental Honors Committee, which can recommend graduation with Special Honors in political science. To be eligible for enrollment in an honors seminar, students must be political science majors, have successfully completed PSc 101, have achieved a quality-point index in the major of at least 3.3, and be juniors or seniors.

Minor in political science—Required: 15 semester hours of second-group political science courses, including a distribution requirement of one course from each of the four groups listed in item 3 above. A minimum of 9 semester hours of other social science courses is also required.

Master of Arts in the field of political science—Prerequisite: a bachelor's degree with a major in political science from an accredited college or university, or an equivalent degree, and high undergraduate scholastic standing.

Required: The general requirements stated under the Graduate School of Arts and Sciences and either (1) a reading knowledge of a modern foreign language or a specified level of knowledge in statistics, or (2) two graduate-level courses in a cognate discipline. Students may elect one of the following programs: (1) 24 semester hours of graduate course work, plus a thesis (equivalent to 6 semester hours), and the satisfactory completion of a Master's Comprehensive Examination in three subfields selected from those listed under the Ph.D. program; or (2) 33 semester hours of graduate course work without a thesis and the satisfactory completion of a Master's Comprehensive Examination in four subfields selected from those listed under the Ph.D. program.

All students must take one course chosen from PSc 200, 230, or 240 during the first semester of graduate study. The course selected must have the approval of the coordinator of graduate studies.

The department also offers a special concentration in electoral politics. For students choosing this option, the 33-hour nonthesis option is required. The curriculum is composed of 24 hours of required courses related to the theory and practice of electoral politics and 9 hours of elective work in American government and politics. Students with a concentration in electoral politics are exempted from the PSc 200, 230, or 240 requirement.

Doctor of Philosophy in the field of political science—Students of outstanding ability are admitted to the doctoral program upon recommendation of a departmental graduate committee and the concurrence of the dean of the Graduate School of Arts and Sciences.

Required: The general requirements stated under the Graduate School of Arts and Sciences. Each student must complete a General Examination, which covers a major and minor field of study.

PSc 200 and 201 are required of all students unless they demonstrate knowledge of the courses' subject matter by passing a waiver examination.

Each student must choose a major and minor field of study from five principal subject-matter divisions. Each subject-matter division has several subfields of study from which the student, in consultation with an advisor, constructs a program. A major field of study consists of three subfields; a minor field of study consists of two subfields.

The subject-matter divisions and their subfields are (1) theory and methodology (analysis of Western political thought, analysis of Marxist and Marxist–Leninist thought, and scope and methods of political science); (2) comparative and foreign politics (comparative political analysis, regional comparative politics, and domestic politics of a specified major political system); (3) international relations (international politics, international law, international organization, regional international relations, and foreign relations of a specified major political system); (4) American politics (American political process, national policy-making process, American constitutional law and judicial process, science policy, and state, local, and urban politics); and (5) public policy (methods of public policy analysis, science policy, domestic policy analysis, and

national security policy). Quantitative political analysis may be used as a subfield in any of the subject-matter divisions.

Departmental prerequisite: PSc 1 and 2 (or the equivalent) are prerequisite to all second-group courses in political science.

First Group

1 **Introduction to Comparative and International Politics** (3) Gyorgy, Sodaro, Feigenbaum
Comparative and international political systems; emphasis on structures and processes of major foreign governments and the force of basic ideologies. (Fall and spring)

2 **Introduction to American Politics and Government** (3) Wayne, Morgan
Structure, powers, and processes of the American political system. (Fall and spring)

3–4 **Introduction to Political Behavior** (6–6) Lichter
Role of personal and social values in political behavior. Fall: Focus on problems in the American liberal tradition. Spring: A comparative perspective on democratic and authoritarian governments in the 20th century. Admission by special selection process. (Academic year)

50 **Washington, D.C.: History, Culture, and Politics** (3) Gillette and Interdisciplinary Team
Same as AmCv Hist U&RP 50.

91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course offered by the Departments of East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Political Science, and Religion. A comprehensive and integrated introduction to the civilization and present problems of East Asia. (Spring)

Second Group

101 **Scope and Methods of Political Science** (3) Kim, Bositis, Lebovic
Nature of political inquiry, approaches to the study of politics and government, empirical methods of research. (Fall and spring)

102 **Empirical Political Analysis** (3) Bositis
Extensive examination of empirical research methods in the analysis of political behavior. Research design, data collection (survey and aggregate), and data analysis. Prerequisite: PSc 101 or permission of instructor. (Spring)

104 **Methods of Public Policy Analysis** (3) Henig
Introductory overview of the concepts, issues, and techniques of systematic policy analysis and its role in the policy process. (Fall and spring)

105 **Political Theory: Major Issues of Western Political Thought I** (3) Linden
Foundations of Western political thought—Plato to Aquinas. (Fall and spring)

106 **Political Theory: Major Issues of Western Political Thought II** (3) Linden
Theoretical roots of modern political order and disorder—Machiavelli to Rousseau. (Fall and spring)

107 **Issues in Modern Political Thought** (3) Linden, Wolchik
Issues of modern political thought as seen through major representative thinkers. Emphasis on conservative, liberal, and radical thought. (Fall and spring)

108 **Modern Communist Ideologies** (3) Elliott
Intensive study of theories and philosophical assumptions of modern communism. Emphasis on the careers and ideas of leading figures: Marx, Engels, Lenin, Stalin, Khrushchev, and Mao. (Spring)

110 **American Political Thought** (3) Morgan
Political thought in the U.S. from colonial times to the present as seen through major representative writings. (Spring)

111 **State and Urban Politics** (3) Henig
Comparative analysis of context, institutions, processes, and policies of state and urban political systems. (Fall)

112 **State and Urban Policy Problems** (3) Henig
Selected issues in state and urban policy-making, with emphasis on urban and metropolitan settings. (Spring)

114 **U.S. Constitutional Law and Politics I** (3) Morgan
Separation of powers, federal–state relationships, economic regulation. (Fall)

115 **U.S. Constitutional Law and Politics II** (3) Morgan
Political and civil rights. (Spring)

116 **The American Presidency** (3) Wayne
Examination of the politics of presidential selection, the authority of the contemporary institution, the mechanisms and processes for formulating public policy, and the influences of personality on performance. (Fall and spring)

117 **Public Administration and Bureaucratic Politics** (3) Rycroft
Basic concepts in public administration; influence of bureaucratic politics on policy formulation and implementation. (Fall)

118 **Legislative Process** (3) Deering
Theory, structure, and process of the U.S. Congress, with emphasis on elections, party organization, committees, and floor procedure, in the context of executive–legislative relations and interest-group activities. (Fall and spring)

119 **U.S. Political Parties and Politics** (3) LeBlanc
Role of parties as a linkage between mass preferences and government policies. Organization, nominations, voting, and activities in legislative and executive branches. (Fall and spring)

120 **Public Opinion and Political Socialization** (3) Bositis
Sources of mass political attitudes and behavior; voting and political campaigning. (Fall)

122 **Science, Technology, and Politics** (3) Logsdon, Rycroft
Multiple impacts of scientific and technological developments on the political systems. Discussion of public policies for support, use, and control of science and technology. (Fall and spring)

124 **Issues in Domestic Public Policy** (3) Henig, Deering
Examination of the decision-making process and the substance of various issues in domestic public policy in such areas as crime, economics, education, energy, the environment, poverty, and health. (Fall and spring)

128 **Governmental Processes and the News Media** (3) Deakin
Same as Jour 128.

129 **TV News: The Politics of Visibility** (3) Lichter
Examination of the impact of television on American politics and society, the nature of coverage of political issues and campaigns, the dynamics of selecting and presenting news stories. Same as Jour/CmTr 129. (Fall and spring)

130 **Comparative Government and Politics I** (3) Feigenbaum, McClintock
Comparative political analysis with primary focus on the principal states of Western Europe. (Fall and spring)

131 **Comparative Government and Politics II** (3) Gyorgy, Sodaro, Wolchik
Government and politics of the communist nations; emphasis on the Soviet Union and countries of Eastern Europe. (Fall and spring)

140 **International Politics** (3) Nau, Sodaro, Joyner, Lebow
International actors, international and domestic environments of foreign policy, global and regional patterns, general characteristics of foreign policy. (Fall and spring)

142 **International Organizations** (3) Nau, Stambuk
Development and operations of the United Nations, regional organizations and functional international organizations. (Fall and spring)

144 **Public International Law** (3) Joyner
Survey of international law, with emphasis upon law's conceptual development and practical application to contemporary international issues. (Fall and spring)

146 **U.S. Foreign Policy** (3) Sapin
Constitutional, political, and international factors that determine the formulation, execution, and substance of U.S. foreign policy. (Fall and spring)

149 **Military Force and Foreign Policy** (3) Sapin, Lewis
Impact of military considerations on U.S. foreign policy; major problems in national security, e.g., strategic weaponry, military assistance, regional security problems. (Fall and spring)

161 **European–Atlantic Relations** (3) Stambuk
International politics of the North Atlantic area, the European Common Market, and U.S.–European relations. (Fall)

165 **Government and Politics in Eastern Europe** (3) Gyorgy
Study of the contemporary social and ethnic structures, governmental systems, and international position of the Eastern European states within the Soviet system. (Summer)

168 **Soviet Foreign Policy** (3) Elliott
Relations with U.S., Europe, Third World, China; international communism; instruments of foreign policy; interrelationships between domestic and foreign policies; ideology and foreign policy. (Fall)

170 **Governments and Politics of China, Japan, and Korea** (3) Hinton
Political institutions and processes of China (including Taiwan), Japan, and Korea since World War II. Influence of indigenous traditions and foreign contacts. (Fall, even years)

173 **Governments and Politics of South and Southeast Asia** (3) Hinton
Interaction of traditional, colonial, and contemporary influences in the domestic and international politics of the Indian subcontinent and of mainland and insular southeast Asia. (Fall, odd years)

175 **International Relations of East Asia** (3) Kim
Analysis of the foreign policies of selected East Asian countries and the foreign policies of major powers toward the region. (Fall)

176 **The Arab–Israeli Conflict** (3) Reich and Staff
Origins, evolution, and issues of the Arab–Israeli conflict. (Spring and summer)

177 **Governments and Politics of the Middle East** (3) Reich, Joyner
Politics of the eastern Arab states, Turkey, Iran, and Israel. (Fall)

178 **International Relations of the Middle East** (3) Reich
Analysis of the regional and international relations of the Middle East. (Spring)

179 **Israeli Politics and Foreign Policy** (3) Reich
Examination of the institutions, processes, and issues of Israeli politics and foreign policy. (Fall)

180 **Governments and Politics of North Africa** (3) Reich, Lewis
Domestic and international politics of Algeria, Tunisia, Morocco, Libya, Egypt, Sudan; their relations with states of the Middle East. (Spring)

181 **Politics of Middle and Southern Africa** (3) Nimer
Comparative analysis of political systems in selected countries of non-Mediterranean Africa. (Fall)

182 **African International Politics** (3) Nimer
Analysis of interstate relations in Africa and of selected aspects of African relations with the outside world. Recommended prerequisite: PSc 181 or equivalent (Spring)

183 **Governments and Politics of Latin America** (3) McClintock
Political processes and institutions of selected countries in South America, Central America, and the Caribbean. Emphasis on the possibilities for democracy and revolution. (Fall)

184 **International Relations of Latin America** (3) McClintock
U.S.–Latin American relations and foreign policies of selected states. (Spring)

186 **U.S. Policies Toward Sub-Saharan Africa** (3) Nimer
Analysis and evaluation of contemporary U.S. policies and policy-making toward selected areas and individual countries of sub-Saharan Africa: the Horn, East Africa, western Indian Ocean states, southern Africa, Zaire, Nigeria, and Ivory Coast. (Summer)

187 **Internship: Political Behavior** (3) Deering
Study of political behavior through internship experience with Congress, executive departments or agencies, politically active private-sector groups, political parties, or electoral campaigns. Admission requires departmental approval. May be repeated for credit with approval. (Fall and spring)

188 **Internship: Urban Affairs** (3 or 6) Henig
Study of urban political and policy-making processes through assignment to an urban-related political or governmental office. Primarily for senior urban affairs majors. Admission requires departmental approval. (Fall and spring)

189 **Internship: Legal Process** (6) Aron
The legal system and its role in promoting social change. Readings, group discussions, and work with lawyers and third-year law students. Admission requires departmental approval. (Fall and spring)

190 **Selected Topics in Political Science** (3) Staff
(Fall and spring)

191 **Internship: International Affairs** (3 to 9) Sapin
(Formerly Selected Topics: International Affairs)
Faculty-supervised internships in the Department of State, Organization of American States, and other international affairs agencies. Admission by approval of instructor. (Fall and spring)

192 **Proseminar: Political Science** (3) Staff
Examination of selected problems in political science. Admission requires departmental approval. (Fall and spring)

193 **Proseminar: Urban Affairs** (3 or 6) Henig
Readings, research, and class discussion on selected topics in urban politics and policy-making. Primarily for senior urban affairs majors. Admission requires departmental approval. (Fall and spring)

196 **Honors Seminar: Political Theory** (3) Staff
Research on selected topics. Prerequisite: PSc 101. Admission requires departmental approval.

197 **Honors Seminar: American Government and Politics** (3) Staff
Research on selected topics. Admission requires departmental approval. Prerequisite: PSc 101.

198 **Honors Seminar: Comparative Government and Politics** (3) Staff
Research on selected topics. Admission requires departmental approval. Prerequisite: PSc 101.

199 **Honors Seminar: International Politics** (3) Staff
Research on selected topics. Admission requires departmental approval. Prerequisite: PSc 101.

Third Group

200 **Introduction to Political Analysis** (3) Bositis
Alternative approaches to political analysis, construction of research designs and problems of measurement. (Fall and spring)

201 **Empirical Political Analysis** (3) Bositis
Techniques of social science data analysis, with emphasis on statistics and computer applications. PSc 200 or other previous introductory research training is highly desirable. (Spring)

202 **Advanced Topics in Empirical Political Analysis** (3) Bositis
Advanced techniques of data collection and analysis; varying emphasis on such methods as causal modeling, analysis of variance, regression analysis, and simulation. (Fall)

203 **Approaches to Public Policy Analysis** (3) Henig
Empirical and normative foundations of systematic policy analysis: concepts, theories, models, issues, strengths, limitations, and uses and misuses in the policy process. (Fall)

204 **Methods of Public Policy Analysis** (3) Staff
Quantitative and qualitative techniques of systematic policy analysis, such as forecasting, cost–benefit analysis, simulation, operations research, social indicators, and quasi-experimental methods. Prerequisite: PSc 203 or equivalent. (Spring)

205 **Readings in Political Theory** (3) Linden
Selected major works, both ancient and modern, that illuminate basic problems and questions of political theory. (Fall)

206 **Topics in Political Theory** (3) Linden
Advanced readings and group discussions. Analysis and interpretation of selected concepts and schools of thought. (Spring)

207 **Readings in Socialism and Communism** (3) Elliott, Linden, Wolchik
Readings and discussions of works illuminating the development of pre- and post-Marxian socialist thought. (Fall)

208 **Readings in Marxism–Leninism** (3) Elliott, Linden
Readings and discussions in Marxism–Leninism and its controversies from Lenin to the present. (Spring)

210 **The American Political Process** (3) Deering
For graduate students with a limited background in American government. A survey of American political institutions, processes, and behavior. Departmental prerequisites waived. (Fall)

211 **State and Urban Politics** (3) Henig
Comparative analysis of the context, institutions, processes, and policies of state and urban political systems. (Fall)

212 **State and Urban Policy Problems** (3) Henig
Analysis of public policy issues confronting state and urban governments; emphasis on the theoretical roots and empirical impact of past and present programs in such areas as housing, education, poverty, and crime. (Spring)

214 **Topics in Constitutional Law** (3) Morgan
Lectures and group discussions on constitutional law and politics. (Fall, even years)

215 **Judicial Policy-Making** (3) Morgan
Role of the judiciary in policy formulation; emphasis on the U.S. Supreme Court and civil liberties issues. (Fall, odd years)

216 **American Presidency** (3) Wayne
Personalized and institutionalized aspects of the presidency with particular emphasis on the politics of legislative policy-making. (Fall)

217 **Bureaucratic Politics** (3) Rycroft
Structure and operation of governmental bureaucracy with particular emphasis on the politics of formulating and implementing public policy. (Spring)

218 **Legislative Politics** (3) Deering, Smith
Theory, structure, and process of the U.S. Congress, with emphasis on member–constituency relations, individual and collective decision making, party and committee activities, executive–legislative relations, and interest-group activities. (Spring)

219 **American Political Parties and Elections** (3) LeBlanc
Nature and functions of American political parties: organizational status, nominating and electoral politics, and role in governing.

220 **Public Opinion and Political Socialization** (3) Bositis
Sources and dynamics of public opinion and political socialization. (Spring)

222 **Science, Technology, and Public Affairs** (3) Logsdon, Rycroft
Introduction to the study of science, technology, and public policy; focus on policy issues that arise from interactions between scientific and technological developments and government activity. (Fall)

223 **Science, Technology, and Public Policy** (3) Logsdon, Rycroft, Nau
Research and intenstive analysis of selected policy issues with significant scientific or technological aspects. Prerequisite: PSc 222, 252. (Spring)

224 **Domestic Policy Analysis—Selected Topics** (3) Staff
Analysis of U.S. policy toward selected domestic problems.

225 **Issues in Political Economy: Economic Policy Analysis** (3) Staff
Analysis of selected topics in U.S. monetary and fiscal policy. Offered off campus only.

226 **Issues in Political Economy: The Economic Policy Process** (3) Staff
Economic analysis of selected legislative issues and the effect of various economic pressures on policy outcomes. Offered off campus only.

230 **Comparative Government and Politics I** (3) Kim, McClintock, Feigenbaum
Examination of basic approaches to comparative politics. (Fall)

231 **Comparative Government and Politics II** (3) Kim, McClintock, Feigenbaum
Comprehensive examination of specific issue areas in comparative political analysis. (Spring)

232 **Comparative Communist Systems I** (3) Wolchik
Comparative analysis of the political history and contemporary political processes of communist states, with emphasis on the Soviet Union and Eastern Europe. Same as Hist 232. (Fall)

233 **Comparative Communist Systems II** (3) Wolchik
Comparative analysis of the political history and contemporary political processes of communist states, with emphasis on China and Cuba, and non-ruling communist parties. Same as Hist 233. (Spring)

234 **Comparative Legislative Systems** (3) Staff
Selected problems of legislative theory and behavior from a comparative perspective with particular reference to the parliamentary systems of West Germany, France, and Britain. Offered off campus only.

238 **U.S. Foreign Economic Policy** (3) Nau
Exploration of ideas and issues involved in U.S. foreign economic policy including relationship of economic and security issues, interdependence, protectionism, role of the dollar, industrial policy, and the debt crisis. (Fall)

239 **U.S. Foreign Economic Policy-Making** (3) Nau
Research seminar focusing on domestic interests and the policy process in U.S. foreign economic policy-making, including business, labor, and public interest groups, the interagency process, and the role of the President. (Spring)

240 **Theories of International Politics I** (3) Nimer, Lebovic, East
Critical examination of contemporary theories, both empirical and normative, with emphasis on actor theory. (Fall)

241 **Theories of International Politics II** (3) Nimer, Lebovic, East
Critical examination of contemporary theories, both empirical and normative, with emphasis on interaction theory. (Spring)

242 **Problems in International Organizations I** (3) Nau, Stambuk
Collective security, law, and the politics of international organizations. (Fall)

243 **Problems in International Organizations II** (3) Nau, Stambuk
Social and economic interdependence and the politics of international organizations. (Spring)

244 **International Law I** (3) Joyner
The sources and development of international law, with special attention given to current trends and future problems. (Fall)

245 **International Law II** (3) Joyner
Critical examination of selected contemporary problems of world order, e.g.,

legal issues involving global resource regimes, economic development, and human rights. (Spring)

246 **U.S. Foreign Policy-Making** (3) Sapin
Patterns and problems in contemporary U.S. foreign policy-making. Attention to domestic political factors as well as relevant institutions and agencies. (Fall)

247 **U.S. Foreign Policy** (3) Sapin
(Formerly Public Opinion and Foreign Policy)
The substance of contemporary U.S. foreign policy: major problems, concepts, and lines of development since World War II. (Spring)

248 **U.S. National Security Policy-Making** (3) Sapin, Lewis
Executive organization and processes for national security policy-making. Attention to relevant theoretical approaches. (Fall)

249 **U.S. National Security Policy** (3) Sapin, Lewis
Fundamental considerations: selected issues, e.g., arms control and disarmament, regional security problems, military assistance. (Spring)

250 **Foreign Policy Analysis—Selected Topics** (3) Staff
Analysis of U.S. foreign policy toward selected world regions.

252 **Science, Technology, and International Affairs** (3) Nau
Exploration of implications of technological change for international politics and influence of foreign policy interests on international technological development. (Spring)

253 **Defense Policy and Program Analysis I** (3) Kugler
Analysis of U.S. defense budget, force posture, and program priorities. Methodology for defense planning and program evaluation. Special attention to strategic nuclear forces. (Fall)

254 **Defense Policy and Program Analysis II** (3) Kugler
Analytical methodology for defense policy and program choices. Special attention to U.S. general purpose forces, including forces for NATO/Europe. (Spring)

255–56 **Applied Quantitative Techniques** (3–3) Hildebrandt
The application of quantitative techniques in the solution of issues in defense policy. (Academic year)

257 **Arms Control and Disarmament** (3) Staff
Major issues and trends in the postwar development of U.S. arms control and disarmament policy. (Spring)

258 **Communist Party of the Soviet Union** (3) Sodaro
Analysis of the internal evolution of the Communist Party and and its role in the Soviet system from its origins to the present day. Same as Hist 258. (Spring)

260 **Western European Politics** (3) Feigenbaum
Examination of the principal characteristics of the British, French, West German, and Italian political systems, comparing their institutional and behavioral adaptations to the problems of advanced industrial democracies. (Fall)

261 **Politics of the European Community** (3) Stambuk
Problems in Western European politics, with emphasis on supranational political processes and selected policy outcomes in the context of the European Common Market. (Spring)

263 **Communism in Non-Communist Europe** (3) Sodaro
Examination of nonruling European communist parties; relations between these parties and other ruling and nonruling communist parties. (Fall)

264 **The International Politics of Eastern Europe** (3) Gyorgy
Major historical, political, social, and regional factors that have shaped the interwar, World War II, and postwar evolution of Eastern Europe; emphasis on foreign relations with outside powers and on regional East–West contacts. (Fall)

265 **Governments and Politics of Eastern Europe** (3) Gyorgy
A comparative study of Eastern European states: political, social, economic institutions: emphasis on domestic conditions and problems of individual Eastern European countries. (Spring)

266 **Readings in Soviet Government and Politics** (3) Elliott, Linden
Readings in contemporary Soviet domestic government and politics. (Fall

267 **Soviet Government and Politics** (3) Elliott, Linden, Wolchik
Research seminar in selected problems of Soviet domestic government and politics. Emphasis: since Stalin. Prerequisite: PSc 266 or permission of instructor. (Spring)

268 **Soviet Foreign Policy** (3) Elliott
External problems and policies of the U.S.S.R., with emphasis on the period since Khrushchev. Relations with other communist states, Western powers other countries, and nonruling communist parties. (Spring)

269 **Soviet Military Policy and Strategy** (3) Warner, Elliott
Soviet developments in military policy and strategy with attention to intra-bloc military cooperation, political context of Soviet military policy, significant changes in recent Soviet military thought. (Fall or spring)

270 **Politics of the People's Republic of China I** (3) Hinton
Introduction to the substance of and literature on contemporary Chinese politics. Discussion and reading. (Fall)

271 **Politics of the People's Republic of China II** (3) Hinton
Research seminar. Introduction to the analysis of official Chinese documents and other primary materials. Presentation of student papers. Prerequisite: PSc 270 or equivalent. (Spring, even years)

272 **Foreign Policy of the People's Republic of China** (3) Hinton
Objectives; formulation and implementation; the People's Republic of China as Asian state, revolutionary influence, would-be great power. (Spring, even years)

275 **International Politics of East Asia** (3) Hinton
Foreign policies and international behavior of the regional states (especially China, Japan, and Vietnam) and the extraregional powers (especially the U.S. and the U.S.S.R.). (Spring, odd years)

276 **Governments and Politics of Japan and Korea** (3) Kim
Readings and research on the domestic and foreign policies of Japan and North and South Korea. (Fall or spring)

277 **Governments and Politics of the Middle East** (3) Reich
Readings and research on selected problems of the governments and politics of the Middle East. (Fall)

278 **International Relations of the Middle East** (3) Reich
Readings and research on the regional and international relations of the Middle East. (Spring)

280 **Governments and Politics of North Africa** (3) Reich, Lewis
Readings and research on selected problems in the governments, politics, and international relations of North Africa. (Fall)

281 **Topics in African Politics** (3) Nimo
Readings, research, and discussion of selected aspects of African domestic and international politics. (Fall)

283 **Governments and Politics of Latin America** (3) McClintock
Readings and discussion on the politics of selected countries in South America, Central America, and the Caribbean. Emphasis on the possibilities for democracy and revolution. (Fall)

284 **International Relations of Latin America** (3) McClintock
Readings and discussion on U.S.-Latin American relations and the foreign policies of selected states. (Spring)

285 **Problems in Latin American Civilization** (3) Starr
Same as Anth/Econ/Geog/Hist/Span 287. Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be

repeated for credit. Admission by permission of instructor. (Fall and spring)

286 **Selected Topics in American Politics** (3) Staff
Readings and discussion. (Fall or spring)

287 **Selected Topics in Political Theory** (3) Staff
Readings and discussion. (Fall or spring)

288 **Selected Topics in Comparative Politics** (3) Staff
Readings and discussion. (Fall or spring)

289 **Selected Topics in International Politics** (3) Staff
Readings and discussion. (Fall or spring)

291 **Colloquium: East Asia** (3) Hinton
Interuniversity colloquium for advanced students of East Asian affairs. Admission by permission of the instructor. (Fall and spring)

292 **Colloquium: Russia and Eastern Europe** (3) Gyorgy
Interuniversity colloquium for advanced students of Russian and Eastern European affairs. Admission by permission of the instructor. (Fall and spring)

297 **Reading** (3) Staff
Limited to master's degree candidates. Written permission of instructor required. (Fall and spring)

298 **Research** (3) Staff
Limited to master's degree candidates. Written permission of instructor required. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

510 **Campaign Research** (3) Staff
Methods of data collection and analysis: polling, questionnaire construction, sampling, targeting, and interpretation of data. Prerequisite: PSc 201. Offered as the demand warrants.

511 **Electoral Laws and Financial Practices** (3) Staff
State statutes; registration and filing procedures; federal campaign finance legislation, compliance procedures, and enforcement. Offered as the demand warrants.

512 **Campaign Organization and Management** (3) Staff
Readings and discussions on modern campaigning; field work, media planning, public relations, fund raising, strategy, and tactics. Guest lectures by professional campaign consultants. Offered as the demand warrants.

513 **Seminar: The Electoral Process** (3) Staff
Research leading to the development of a campaign plan for a particular electoral contest; use of the media, polling, campaigning, organization, issue development, and fund raising. Enrollment by permission of the instructor. Offered as the demand warrants.

514 **Media and Politics** (3) Staff
Role of the media in modern electoral politics, with emphasis on television news coverage, political debates, political advertising, and their impact on the electorate. Offered as the demand warrants.

515 **Internship: Electoral Behavior** (3) Staff
Study of the political system through an internship with a political campaign. Offered as the demand warrants.

Fourth Group

301 **Advanced Reading and Research in Political Theory** (3) Staff

310 **Advanced Reading and Research in American Politics** (3) Staff

340 **Advanced Reading and Research in Comparative Politics** (3) Staff

350 **Advanced Reading and Research in International Politics** (3) Staff

397 **Advanced Reading** (3) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

398 **Advanced Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PORTUGUESE

See **Romance Languages and Literatures.**

PSYCHOLOGY

Professors T. Hunt *(Emeritus)*, E.L. Phillips, J.N. Mosél, B.I. Levy, W.E. Caldwell, R.D. Walk, R.K. White *(Emeritus)*, A.D. Kirsch, E. Johnson *(Emeritus)*, V. Kirkbride *(Emeritus)*, C.E. Rice, E. Abravanel *(Chairman)*, D.E. Silber, J. Miller, C.J. Lange, A.J. Caron *(Research)*, F.L. Schmidt *(Research)*, L.A. Rothblat, M.L. Meltzer, R.F. Caron *(Research)*
Professorial Lecturers R.K. Kahn, J.K. Harper
Associate Professors C.E. Tuthill, S.A. Karp, R.W. Holmstrom, P.J. Poppen, L. Brandt, S.K. Green, S. Hashtroudi, S. Shiflett
Assistant Professor L.R. Offermann
Adjunct Assistant Professors E.C. Klosson, D.P. McNally

Clinical Training Staff

Clinical Professors J. Borriello, J.W. Cummings, D.A. Evans, R.B. Kurz
Associate Clinical Professors E. Blum, D.A. Jensen, M.E. Zedek, E.J. Jordan
Assistant Clinical Professors H. Bruml, D.M. DePalma, C.S. Detchon, P.O. Heinemann, M. Harris

Bachelor of Arts with a major in psychology (departmental)—The following requirements must be fulfilled.

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—7 or 8 semester hours selected from Psyc 1, 5, and 6.
3. Required courses in related areas:

(a) 3 semester hours selected from Stat 51, 53, or any first-group course in mathematics except Math 3, 6, or 9. (Students expecting to do graduate study in psychology should elect Stat 53.)

(b) 9 semester hours selected from American civilization, anthropology, economics, geography and regional science, history, philosophy (Phil 71, 113, 151 recommended), political science or sociology, of which 6 hours must be from one of the following: anthropology, economics, history, political science, or sociology. If a student takes more than 6 hours in any one department, the excess will be credited to electives.

4. Required courses in the major—27 semester hours in second-group psychology courses, including Psyc 196 and one course from each of the following groups—Group A: Psyc 118, 121, 161; Group B: Psyc 115, 144, 151, 156; Group C: Psyc 101, 129, 131; Group D: Psyc 110, 111, 112, 132.

It is recommended that students contact their academic advisors as soon as possible for assistance in planning their programs of study.

Although there is no foreign language requirement, students contemplating graduate study are reminded that many graduate schools require knowledge of one and sometimes two foreign languages.

To qualify for graduation with Special Honors the student must fulfill the general requirements stated under Regulations, take an honors seminar (Psyc 197) or a 200-level seminar, and complete an independent study project (Psyc 191) with distinction. The grade point average in psychology required for graduation with Special Honors is 3.3.

Bachelor of Arts/Master of Arts in the field of art therapy—A five-year program leading to the B.A. in the field of fine arts or psychology and the M.A. in the field of art therapy. See Art Therapy.

Minor in psychology—18 semester hours are required, including Psyc 1 and at least 9 semester hours of second-group psychology courses. Students considering graduate study in psychology are advised to take Psyc 5 or 6, a distribution of courses from categories A, B, C, D above, Psyc 196, and an elementary course in statistics.

Master of Arts in the field of psychology—Prerequisite: the degree of Bachelor of Arts with a major in psychology at this University, or an equivalent degree. Admission to the program is limited; preference will be given those who plan to continue toward a Doctor of Philosophy degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Of the 24 required semester hours (exclusive of the thesis), a minimum of 18 must be in third-group psychology courses, including Psyc 202 and either 203 or 204; 6 may be in related fields approved by the department. For detailed requirements consult the chairman of the department.

Doctor of Philosophy in the field of psychology—Prerequisite: the degree of Bachelor of Arts with a major in psychology. Students admitted from other disciplines will be expected to complete prerequisite undergraduate courses to prepare for graduate study in psychology. Qualifying scores on the Miller Analogies Test and the Aptitude Test of the Graduate Record Examination are required for admission.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) the satisfactory completion of the tool requirement; (2) Psyc 202, 203–4, and an appropriate statistics course; and (3) the satisfactory completion of a Preliminary Examination and a major Field Examination.

Areas of study: clinical, developmental, experimental, industrial and organizational, and social psychology.

Departmental prerequisite: Psyc 1 or 5 or 6 is prerequisite to all other courses in psychology. The departmental prerequisite may be waived with the permission of the instructor.

Students electing psychology courses in the freshman year should begin with Psyc 1; with permission of the instructor, students may elect Psyc 5–6 in the freshman year.

First Group

1 **General Psychology** (3) Staff
Fundamental principles underlying human behavior. (Fall and spring)

5–6 **Principles and Methods of Psychology** (4–4) Walk, Hashtroudi
Lecture (3 hours), laboratory (3 hours). An experimental approach to understanding behavior; individual and class experiments performed. Psyc 5: sensation, perception, and emotions and their relation to adaptive behavior. Psyc 6: memory, human information processing, learning, and motivation. Laboratory fee, $10 per semester. (Academic year)

8 **Psychology of Motivation and Personality** (3) Staff
Introduction to the psychology of personality. Principles of motivation, personality development, social and cultural factors, and assessment and description of personality emphasized. (Fall and spring)

22 **Introduction to Educational Psychology** (3) Kirkbride
The contributions of psychology to education; emphasis on learning.

Second Group

101 **Abnormal Psychology** (3) Silber, Holmstrom
Causes, diagnosis, treatment, and theories of various types of maladjustments and mental disorders. (Fall and spring)

104 **Ecology and Mental Health** (3) Karp
Examination by field research of the linkages between aspects of the physical environment and mental health. Lectures and student field research projects. (Fall)

105 **The Psychology of Consumer Behavior and Attitudes** (3) Phillips
Consumer behavior and attitudes in regard to advertising, buying habits,

consumer action groups and social pressures, and mass persuasion. Lectures and field work. (Spring)

108 **Humanistic Psychology** (3) Mosél
Critical examination of humanistic psychology. Emphasis on role of consciousness in human behavior. Philosophic foundations, existential, phenomenological, and transpersonal psychology. (Spring)

110 **Perception and Understanding in Children** (3) Abravanel
Concepts and research in the area of developmental psychology: emphasis on the growth and development of perception, cognition, and language. (Spring)

111 **Psychology of Childhood** (3) Brandt
Developmental approach to study of the child. Emphasis on the socialization process, learning, and the child's view of the world.

112 **Psychology of Adolescence** (3) Staff
Psychological characteristics and problems peculiar to adolescence, with emphasis on application of psychology to solution of such problems. (Fall or spring)

115 **Psychology of Language and Communication** (3) Mosél
Introduction to psycholinguistics and verbal behavior. Information theory, generative grammar theory, cultural and linguistic structures in perception and neurolinguistics programming. (Fall and spring)

117 **Psychology of Art and Picture Perception** (3) Walk
Principles of perception as applied to art. Theories of Arnheim, Gibson, Gombrich, and Goodman as related to art and picture perception; study of cross-cultural research and research with children.

118 **Neuropsychology** (3) Rothblat
Analysis of neural processes underlying behavior. Basic structure and functions of the nervous system, with emphasis on sensory processes, learning and memory, motivation, and emotion. (Fall and spring)

119 **Group Dynamics** (3) Miller
Relationship of the individual to groups, collectivities, and larger social systems. Theory, research, and applications of group and organizational processes, emphasizing contributions of Freud, Bion, Slater, Miller and Rice. Opportunity is provided to attend a group dynamics workshop, which is recommended but not required. Enrollment limited. (Spring)

121 **Psychology of Learning** (3) Hashtroudi
Theories and issues related to basic learning processes as determinants of behavior. Emphasis on current research using both human and animal subjects. (Fall)

122 **Psychology and Human Relations** (3) Silber
Understanding human relations and T-group techniques by evolving an ongoing T-group within the course itself. For junior and senior undergraduate social science majors; open to others with permission of instructor. (Summer)

129 **Theories of Personality** (3) Karp, Poppen, Rice
Survey of personality theories; emphasis on their application to problems of individuals. (Fall and spring)

130 **Seminar: Political and Social Implications of Current Approaches to Psychological Treatment** (3) Karp
Discussion and presentation of recent works, such as those of Szasz, Goffman, and various writers on minority liberation, bearing upon the implications for individuals and society of various approaches to psychological treatment, including psychotherapy and behavior modification.

131 **Psychological Tests** (3) Hunt, Karp, Levy
Survey of psychological tests and their more common uses in business, industry, government, law, medicine, and education. Material fee, $10. (Fall and spring)

132 **Socialization in Childhood** (3) Brandt
Examination of primary methods by which the child is shaped in terms of social judgment and self-control; internalization of controls, assimilation of

societal values and parenting procedures. Organized by focus on issues according to developmental level.

135 **Freud and Modern Psychoanalysis** (3) Miller
Introduction to the work of Freud and his impact on modern psychoanalysis, focusing on the meaning of dreams and the unconscious function of conflict and defense, infantile sexuality and the Oedipus conflict, development of the ego, theory of anxiety and neurosis, and the death instinct. (Spring)

144 **Industrial/Organizational Psychology** (3) Offermann, Shiflett
Psychological concepts and methods applied to problems of personnel management, employee motivation and productivity, supervisory leadership, and organizational development. (Fall and spring)

150 **Psychology of Sex Differences** (3) Poppen
Relevant biological, psychological, and sociological influences on males and females in the development of sex differences: hormonal differences, gender identity, differential socialization of sons and daughters, masculinity/femininity, cultural evaluation of male and female roles. Survey of relevant psychological theory. Emphasis on empirical research and hypothesis testing.

151 **Social Psychology** (3) Tuthill, Poppen, Green
Social foundations of behavior: cognition, motivation, role behavior, communication, small-group processes, and attitudes. (Fall and spring)

154 **Psychology of Criminology** (3) Silber
Examination of many psychological aspects of criminal behavior; personality of criminals and of psychological processes affecting behavior. (Fall)

156 **Psychology of Attitudes and Public Opinion** (3) Tuthill
Psychology of opinion formation, measurement of opinion, social determinants of attitudes, psychological processes in propaganda, bases of receptivity to propaganda, psychological warfare.

158 **Psychology of Interpersonal Attraction** (3) Green
Psychological bases for interpersonal attraction; emphasis on personal variables, relevant theoretical approaches, and interpersonal processes.

161 **Comparative Psychology** (3) Caldwell
Lectures and demonstrations on animal psychology. Psychological processes in infrahuman organisms, evolution of behavior, the place of animal experimentation and research in psychology. (Spring)

168 **Principles and Techniques in Neuropsychological Research** (3) Rothblat
Introduction to basic anatomical, physiological, and behavioral techniques used in neuropsychological research to explore relationships between the brain and behavior. Admission by permission of instructor. Laboratory fee, $20.

170 **Clinical Psychology** (3) Meltzer, Levy
An exploration of the history, functions, and problems of the clinical psychologist. Assessment, treatment, community approaches, ethics. Prerequisite: Psyc 101, 131.

138 **Attitudes Toward Death and Dying** (3) Staff
Exploration of the many different aspects, attitudes, and experiences associated with the process of death and dying. Limited to juniors and seniors.

191 **Independent Research in Psychology** (3) Staff
Opportunity for work on individual library or experimental projects. Open to qualified students by permission; arrangements must be made with the sponsoring faculty member prior to registration. May be repeated once for credit. (Fall and spring)

192 **Field Experience in Psychology** (3) Abravanel
Senior psychology majors will spend a minimum of six hours a week in a local mental health, rehabilitation, school, or community setting. Students registering for this course must have blocks of time available in their class schedules. (Fall and spring)

196 **History and Systems of Psychology** (3) Caldwell
Senior capstone course that includes a survey and integration of the major viewpoints and concepts of psychology. Required of psychology majors. (Fall and spring)

197 **Honors Seminar in Psychology** (3) Staff
Selected topics in psychology that change from semester to semester. Intended primarily for juniors who plan to enroll in Psyc 191 (independent research) in the senior year. May be repeated for credit.

198 **Current Research Issues in Psychology** (3) Staff
Conducted as a seminar. Recent experiments in psychology, including those performed by members of the class; emphasis on student participation. May be repeated for credit.

Third Group

Third-group courses are limited to graduate students in psychology, except by special permission of instructor.

202 **Psychological Research Methods and Procedures** (3) Abravanel, Holmstrom
Required in all graduate psychology programs. Prerequisite: graduate standing, a laboratory course in psychology, and an elementary course in statistics (Spring)

203–4 **Experimental Foundations of Psychology** (3–3) Hashtroudi, Rothblat, and Staff
Required of doctoral students in psychology during first year of study. Psyc 203 Basic issues in learning and motivation. Psyc 204. Physiological processes; sensation and perception. (Academic year)

207–8 **Psychological Assessment** (3–3) Holmstrom, Levy, Silber, Meltzer
Open only to clinical graduate students in the Department of Psychology. Theoretical and clinical aspects of assessment; includes interviewing, psychometric tests, and projective techniques. Two-hour laboratory—diagnostic work at clinical facilities. Material fee, $10 per semester. (Academic year)

209 **Seminar: Psychology of Motivation** (3) Caldwell
Various theoretical approaches to the psychology of motivation; systematic concepts and experimental findings deriving from each approach. (Spring)

211 **Assessment of Cognitive Functioning** (3) Levy
Concepts of intelligence and achievement and their assessment through a variety of individual procedures. Material fee, $20. Admission by permission of instructor. (Summer)

212 **Personality Assessment by Projective Techniques** (3) Levy
Methods of personality assessment, primarily the Rorschach. Material fee, $15. Admission by permission of instructor. (Summer)

213–14 **Seminar: Developmental Psychology** (3–3) Abravanel, Brandt
Psyc 213: research and theory in developmental psychology, with emphasis on cognitive, perceptual, and language functioning development. Psyc 214: current research and theoretical issues in cognitive and social development in infancy and the social bases of communication and language. (Academic year)

215 **Psychodynamic Approaches to Child Assessment and Therapy** (3) Miller
(Formerly Personality Assessment by Multiple Procedures)
A broad range of issues in child personality development will be considered, with special focus on drives, interpersonal relations, defenses, intellectual capacities, and moral development. Admission by permission of instructor. Material fee, $10. (Fall)

216 **Psychological Assessment by Graphic Means** (3) Levy
Examination of graphic procedures for assessment of intelligence and personality; clinical use and evidence of validity. Common interpretive principles sought. Human figure drawings and free paintings as examples. Admission by permission of instructor. (Fall)

218 **Seminar: Systems of Psychotherapy** (3) Silber
Introduction to theory and technique of psychotherapeutic approaches: psychoanalytic, ego centered, nondirective, transactional, and others. Original sources surveyed. (Summer)

219 **Group Dynamics** (3) Miller
Relationship of the individual to groups, collectivities, and larger social systems. Theory, research, and applications of group and organizational processes, emphasizing contributions of Freud, Bion, Slater, Miller and Rice. Opportunity is provided to attend a group dynamics workshop, which is recommended but not required. Enrollment limited.

220 **Seminar: Abnormal Psychology** (3) Miller
Study of selected problems of psychopathology. (Fall)

221–22 **Seminar: Group Psychotherapy** (3–3) Borriello
For graduate students in the clinical psychology program. Open to others if space permits and with permission of instructor. Psyc 221: Survey of group therapy approaches; Psyc 222: Supervised experience with therapeutic groups. Prerequisite to Psyc 221: Psyc 219. (Alternate academic years)

223 **Seminar: Learning** (3) Hashtroudi
Selected topics of current research interest in the psychology of learning. (Spring)

225 **Behavioral Approaches to Child Assessment and Therapy** (3) Staff
(Formerly Seminar: Child Psychotherapy)
Child assessment and treatment from a behavioral viewpoint. The application of conditioning, reinforcement, and shaping principles with reference to specific disorders of childhood.

226 **Seminar: Clinical Psychology of Childhood and Adolescence** (3) Brandt
For graduate students in psychology; open to others with permission of instructor. Exploration of major topics concerning psychopathology in children and adolescents; discussion of nosological issues with emphasis on theoretical and research literature.

227–28 **Seminar: Principles of Psychotherapy** (3–3) Kahn
For graduate students in clinical psychology; open to others with permission of instructor, if space permits. Patient's needs and demands on the therapist. Case participation heavily relied upon. Prerequisite: Psyc 218.
(Academic year)

229 **Seminar: Principles of Behavior Change** (3) Phillips
Stimulus–organism–response variables and their interactions, with emphasis on learning theory as applied to clinical problems. (Fall)

230 **Methods in Applied Behavior Analysis** (3) Staff
Methodology used in clinical behavioral research and other areas, using a small number of subjects. Research designs and data collection techniques are emphasized. (Fall)

231 **Development of Psychometric Instruments** (3) Mosél
Quantitative techniques and principles used in construction, standardization, and evaluation of personality and ability measures for research and practice; quantification of human judgment for measurement purposes. Prerequisite: course in tests and measurements and an elementary course in statistics. (Fall)

232 **Ego Psychology and Theories of Object Relations** (3) Holmstrom
Emphasis on theoretical contributions of Freud, Hartmann, Kris, Klein, Rapaport, Kernberg, and others. Assessment and treatment are addressed, primarily with reference to investigations of borderline and characterological disorders. (Spring)

234 **Seminar: Theory of Psychological Measurement** (3) Mosél
Examination of classical test theory (which underlies most current test construction and interpretation) and the newly emerging area of item-response theory. Recent developments in validity generalization.
(Spring—alternate years)

235 **Seminar: Community Mental Health** (3) Staff
For graduate students in the Department of Psychology; open to others, with permission of instructor, only if space permits. Survey of issues and techniques in community mental health; emphasis on educational systems and community mental health issues. Prerequisite: Psyc 219.

237–38 **The Practice of General Psychology** (3–3) Meltzer
Application of psychological principles and findings to a wide spectrum of human problems. Professional issues facing the psychologist offering services. Participation in the development, implementation, and evaluation of applied psychological services and projects. (Academic year)

240 **Seminar: Selected Topics in Psychopathology** (3) Silber
Examination of current research and theory in psychopathology. (Spring)

241–42 **Family Systems: Theory, Practice, and Research** (3–3) Staff
Family dynamics and their implications for assessment and treatment. Special emphasis on the role of research in the process of evaluation of family systems and family therapy. Enrollment limited to advanced doctoral students in clinical psychology. (Academic year)

243 **Psychoanalytic Theory and Research** (3) Miller
An introduction to classical and modern psychoanalytic theory and research. A review of Freud's central works, focusing on his case studies and their role in theory development. Emphasis on instinct theory, with comparisons to contemporary studies of dreams, infant observation, male and female personality development, psychopathology, and related topics.

244 **Theories and Processes of Organizational Management** (3)
Basic functions and techniques of organizational management—design, control, direction, and decision making—examined from the viewpoint of behavioral science.

245 **Seminar: Organizational Behavior** (3) Mosél
Analysis of organizational behavior; emphasis on motivation and productivity. Recent research on employee attitudes, primary group, supervisory leadership, formal and informal organization, job design. (Fall)

246 **Seminar: Personnel Evaluation Techniques** (3) Mosél, Harper
Techniques of personnel selection and performance evaluation. Employment tests, personal data, assessment interviews, performance ratings, and assessment centers. Consideration of federal guidelines in employee selection. Includes practicum.

248 **Organizational Behavior Research Applied to Organizational Intervention and Change** (3) Staff
Emphasis on development of models of organizational effectiveness; design of valid diagnostic instruments; implementation of research strategies; establishment of program-evaluation criteria.

249 **Organizational Behavior Modification** (3) Mosél
Application of operant reinforcement, behavioral systems analysis, and other experimentally derived procedures, such as goal setting and feedback, to improving individual and group work performance. New approaches to intrinsic job motivation based on covert reinforcement principles. (Spring—alternate years)

250 **Human Resources Management** (3) Staff
An examination within a psychological systems perspective of the requirements for integrating employee assessment, placement, training, and motivation modules into a unified human resources development program. Emphasis on models and techniques of organizational development and the utilization of key organizational factors to determine content of the program.

253–54 **Social Psychological Theories and Applications** (3–3) Green, Offermann
Social psychology theories, conceptual approaches, and their applications. Psyc 253: Focus on attitude formation and change and on social-cognition, person perception, attribution, information processing, attraction, stereotyping. Psyc 254: Analysis of intentional and unintentional social influence

processes and their effects on behavior. Current research on conformity, social power, social exchange, and impression management. (Academic year)

255 **Applied Research Methods: Research Design** (3) Green
Analysis of problems in research design in basic and applied social psychological research. Focus on conceptualization, operationalization of variables, and experimental and quasi-experimental design. (Fall)

256 **Applied Research Methods: Data Collection and Analysis** (3) Poppen
Methods of data collection and analysis, especially in field settings and surveys with nonexperimental designs. Topics include methods of obtaining information (questionnaires, interviews, records); creation of indicators; exploratory analysis of large-scale data bases; analysis and interpretation of data when research units have not been randomly assigned to treatments. (Spring)

257 **Current Topics in Social Psychology** (3) Poppen, Green, Offermann
Advanced seminar with focus on major theoretical approaches, research, or problem areas within field of social psychology. Topic changes each semester. (Fall and spring)

260 **Psychology of Work Group Development** (3) Offermann
Examination of theory and research on groups as task performance systems. Approaches to team development as a means of improving work group effectiveness, including goal setting, role clarification, increasing interpersonal skills, and conflict resolution. (Fall)

263 **Evaluation Research** (3) Rice
Research issues and methods in evaluating the impact of social intervention and service programs. Specification of program goals and effectiveness criteria; measurement problems; experimental and quasi-experimental designs; political problems surrounding evaluation research. (Spring, even years)

268 **Seminar: Neuropsychology** (3) Rothblat
Selected problems in research relating the brain and behavior. Independent topics each semester, such as sensory processing, brain development and behavior, clinical aspects of nervous system function.

272 **Seminar: Theories of Personality** (3) Caldwell
Emphasis on theoretical problems and methodology in the field of personality study. (Fall, odd years)

274 **Comparative Psychology and Ethology** (3) Caldwell
Synthesis of the principles and findings of ethology and comparative psychology. Examination of the theories and findings of Lorenz, Tinbergen, and Jakob von Uexküll in the light of recent experimental investigations. (Fall, even years)

281 **Clinical Neuropsychology I** (3) Rothblat
Analysis of experimental and clinical findings from studies attempting to localize and interpret human brain dysfunction, with emphasis on perceptual and cognitive behavior. Topics include overviews of neuroanatomy and neurological techniques, clinical description and theoretical consideration of major neuropsychological disorders, mechanisms underlying recovery of function and potential for rehabilitation. Graduate students in fields other than psychology admitted by permission of the instructor.

282 **Clinical Neuropsychology II** (3) Staff
Examination of important psychological procedures for the assessment of human brain dysfunction. Instruments and batteries such as the Bender-Gestalt, Wechsler Adult Intelligence Scale, Halstead-Reitan Neuropsychological Battery, and Luria's Neuropsychological Tests. Prerequisite: Psyc 211, 212, 281, and permission of the instructor.

289 **Seminar: Current Topics in Experimental Psychology** (3) Staff
Review and discussion of contemporary research and theory in a specialized

field of psychological study, by leaders in the field. Independent topics each semester; may be repeated for credit. (Fall and spring)

290 **Seminar: Macro-organizational Behavior** (3) Rice
Examination of variables characterizing the total organization as the unit of analysis; the relationship of such variables to the behavior of the individual. Complexity, power, and conflict will be considered, along with contextual dimensions such as organizational environment. (Fall, odd years)

291 **Theories of Organizational Behavior** (3) Shiflett
Examination of current theoretical models and research.

292 **Seminar: Perception** (3) Walk
Study of current research and theory in the experimental psychology of perception and perceptual development. (Spring)

295 **Independent Research in Psychology** (3) Staff
Individual library or experimental research under supervision of staff member. Arrangements must be made with sponsoring faculty member prior to registration. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy major field examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PUBLIC ADMINISTRATION—GRADUATE PROGRAMS

Professors D.S. Brown, W. Sommers *(Emeritus)*, S.R. Chitwood, M.M. Harmon, S.J. Tolchin
Professorial Lecturers H.M. West III, B.T. Pitsvada, L.H. Truong
Associate Professors B.L. Catron, A.E. Merget *(Chairman)*, C.W. Washington, W.C. Adams, K. Newcomer
Associate Professorial Lecturer E. Markham

See the School of Government and Business Administration for programs of study in Public Administration leading to the degrees of Master of Public Administration and Doctor of Public Administration.

Second Group

125 **Managing Public Policy** (3) Newcomer, Harmon
Contemporary concepts and issues in public administration and management. Major trends and approaches to governmental administration in the U.S., including the changing federal role, roles of the public sector in relation to the private sector, and managing public agencies at all levels.

Third Group

205 **Introduction to Public Administration and Management** (3) Chitwood, Harmon
Provides frame of reference for study of public administration. Historical development, contemporary approaches, roles of the public manager. Ethics and norms, administrative responsibility and public interest. Management in the public sector. (Fall and spring)

212 **Legislative Management** (3) Tolchin
Analysis of Congress as a management system; examination of its internal administration and its role in formulating policy through legislation. Executive–legislative relationships, staffing practices, budget processes, leadership

rules and procedures, oversight functions, and the management of foreign policy are examined. (Fall)

213 **Administration in the Federal Government** (3) Tolchin
Critical analysis of the structure and administration of the federal government from both a managerial and political perspective. Emphasis on executive branch organization, integration, and coordination, as well as current trends in government regulation, accountability, and effectiveness. (Fall and spring)

215 **Law and the Public Administrator** (3) Chitwood
Exploration and analysis of the functions of law in a democratic society. Emphasis is placed upon the procedural, historial and jurisprudential dimensions of American law. This broad perspective seeks to convey understanding of the law as a legal and moral force guiding and constraining public decision making. (Spring)

216 **Federal Government Regulation of Society** (3) Tolchin
Analysis of the federal regulatory process as it affects the public and private sectors. Specific problems involving presidential management, systemic failures, dejudicializing the regulatory process, policy conflicts, reform efforts, legislative oversight, and economic deregulation. Emphasis is placed on new solutions. Same as BAd 203. (Spring)

217 **Seminar: Development Administration I** (3) Truong
The nature of underdevelopment. Specific problems of less developed countries. National cultures and political and administrative systems. The giving of assistance: types of foreign aid; problems of working with aid givers. (Fall)

218 **Seminar: Development Administration II** (3) Truong
Problem of the transfer of administrative capability from one country to another. Political and administrative development. Unilateral and multilateral approaches. The role of the innovator. Strategies of administrative development. (Spring)

221 **Organization Theory and the Public Sector** (3) Harmon
Analysis of organization theory with special focus on public organizations; current issues in organization theory; decision making; the organizational environment and the changing nature of organizations in a postindustrial society. (Fall and spring)

223 **Behavioral Factors in Large and Complex Organizations** (3) Brown
Analysis of the nature and characteristics of large organizations. Bureaucracies and their behavioral patterns; dysfunctionalism. Approaches to policy guidance and leadership, particularly in large public organizations; influence and control systems. Future trends. (Fall and spring)

224 **Managerial Leadership in Complex Organizations** (3) Brown
What the manager must know and do to provide leadership and guidance in large, complex organizations. Subjects explored include program planning and the supervision and direction of staff to achieve organizational objectives. (Summer)

231 **Personnel Management** (3) Staff
(Formerly Public Personnel Administration)
Same as BAd 210.

232 **The Personnel Manager** (3) Staff
(Formerly Current Issues in Public Personnel Management)
Same as BAd 212.

233 **Seminar: Manpower Planning, Development, and Utilization** (3) West
Examination of public and private manpower trends, problems, policies, and programs. Exploration of approaches to the analysis and administration of manpower programs. Analysis of impact of economic, political, and social factors on manpower. (Fall)

235 **Seminar: Technology Change and Professional Human Resource Planning** (3) Frame, Roma
Addresses human resource problems arising from automation and othe technological changes. Evaluation of these developments in government business, and educational organizations, and their implications for produc tivity, employment, training, and education. Analysis of economic, political and social factors influencing public and private human resource poli cies. (Spring)

236 **Unionism and Collective Bargaining** (3) Burdetsky
(Formerly Labor–Management Relations in the Public Sector)
Same as BAd 217. (Fall)

242 **Administration of State and Local Governments** (3) Washington
Examination of state and local governmental structures and functions, their place within the federal system, their revenue sources, their limitations, and the alternatives available to encourage more effective administration to meet public and private demands. (Fall and spring)

245 **Intergovernmental Relations** (3) Washington
Assessment of the impacts and consequences of changes in the administra tion of intergovernmental policies and programs in the federal system. Legislation, roles, and responsibilities of federal, state, regional, and local systems are examined from both theoretical and practical vantage points.

246 **Dynamics of Citizen Participation in Administration** (3) Taylor, Merget
Review of the basic theory and principles of democracy in the American system of governance. Analysis of the nature of participation in a pluralistic society, including the characteristics and dynamics of citizen-based organiza tions. Exploration of effective methods or models by which citizens may contribute to administration. (Summer)

248 **Financing Local Government** (3) Merget
Analysis of the theory and practice of public finance in local governments. Includes the financing of services through municipal taxation, intergovern mental funds, debt instruments, and other revenue sources. Review of local expenditures as well as financial management practices. (Spring)

249 **Urban Public Policy** (3) Washington
Examination of selected national policies and their effects on urban areas and governments. Emphasis on policy dimensions of urban systems and their relationship to the social, political, and economic context. Against the background of urban politics and administration, areas of health, education, welfare, manpower, transportation, and housing will be addressed. (Spring

251 **Governmental Budgeting** (3) Merget, Pitsvada
Survey of the basic concepts, principles, and practices in governmental budgeting; interrelationship of planning, programming, and budgeting; their role in the management process. (Fall and spring)

252 **Public Expenditure Analysis and Planning** (3) Merget
Intensive analysis of the concepts and principles of economics as applied to the public sector and the analytic techniques used by government agencies for planning, allocating, and managing scarce resources in the implementa tion of public programs. Topics include benefit–cost analysis, program budgeting, productivity, and performance measurement. (Fall and spring)

253 **Public Financial Management Within Federal Agencies** (3) Markham
Intensive analysis of the concepts, principles, and general practices of financial management within federal departments and agencies, focusing on the interrelationships of financial and program functions and drawing on the several financial disciplines of budgeting, accounting, and auditing. (Spring)

260 **Policy Formulation and Administration** (3) Tolchin
Impact of economic and political factors on public policy formulation and implementation; intensive analysis of the analytical, normative, and deci sion-making models of the policy process with special emphasis on their relationship to current policy problems. (Fall and spring)

261 **Policy Analysis in Public Administration** (3) Catron, Newcomer
Current issues in public policy analysis. Conceptual problems encountered in policy analysis. The role and limits of analytic techniques in the development, implementation, and evaluation of public policy. (Fall and spring)

264 **Public Program Evaluation** (3) Newcomer
Theory and practice of program evaluation and evaluative research. Exploration of scope and limitations of current practice in evaluation, considering economic, political, social, and administrative factors. Examination of methodological considerations for design, data collection, analysis, and dissemination. (Spring)

267 **Cases in Public Policy** (3) Catron
Critical analysis of topical issues in public policy, using a case-study approach. Specific issues covered will vary. Designed principally for M.P.A. students in the last half of their program. (Fall)

280 **Purchasing and Materials Management** (3) Sherman
Same as BAd 280.

281 **Procurement and Contracting** (3) Sherman
Same as BAd 281.

282 **Government Contract Administration** (3) Sherman
Same as BAd 282.

283 **Pricing and Negotiation** (3) Sherman
Same as BAd 283.

285 **Systems Procurement and Project Management** (3) Sherman
Same as BAd 285.

288 **Field Problem Studies in Public Administration** (3) Staff
Field research and approved internships on selected issues and aspects of public administration, including specific policy and management problems arising in governmental agencies and related public institutions. Open to master's students upon completion of 9 hours toward the degree program and with the consent of the intern coordinator. (Fall and spring)

289 **Public Program Management and Policy Implementation** (3) Washington
A review of the diverse concepts and methods in public administration; an analysis and integration of the salient political, economic, managerial, and leadership values and issues in implementing public policies. Open only to M.P.A. degree candidates in their final semester of study, serves as a capstone seminar to the M.P.A. program. (Fall and spring)

290 **Special Topics in Public Administration** (3) Staff
Experimental course offering; new course topics and teaching methods. May be repeated once for credit.

292 **Telecommunication Administration** (3) Adams
Human factors in telecommunication innovations within a public organization. Federal role in research, development, and regulation of telecommunications. Acquisitions process for major systems in federal agencies. International telecommunication policies and controversies. Prerequisite: Mgt 244 or EE 251 or permission of instructor. (Spring)

295 **Research Methods** (3) Adams, Newcomer
Theory and practice in research methodology. Data sources and gathering, research models and designs. Critical evaluation of research studies. Emphasis on application of research methods to policy questions. (Fall and spring)

296 **Statistical Applications in Public Administration** (3) Adams, Newcomer
Use of statistics, computers, and SPSS in research and program evaluations. Emphasis on interpretation and use of statistics. Development of basic statistical competency, frequency distribution, sampling, central tendency, variability, correlation, probability, regression, computer assistance. Laboratory fee. (Fall and spring)

298 **Directed Readings and Research in Public Administration** (3) Staff
Supervised reading in selected fields within public administration. Admission by permission of instructor. May be repeated once for credit.

299 **Thesis Seminar** (3) Staff
Examination of thesis standards, research philosophy, and methodology in public administration.

300 **Thesis Research** (3) Staff

Fourth Group
Fourth-group courses are primarily for doctoral students and are offered as the demand requires. They are open to other graduate students at the discretion of the department or the instructor.

311–12 **Seminar: Public–Private Sector Institutions and Relationships** (3–3) Staff
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

323 **Seminar: The Large and Complex Organization** (3) Brown
Unique problems of large, complex organizations: public, private, and mixed. Emerging concepts and theories. Selected issues.

373 **Seminar: Public Administration and American Political and Social Institutions** (3) Merget, Washington
Supervised in-depth study of contemporary literature in selected fields and of research methodology in public administration

374 **Seminar: Trends in Public Administration Theory** (3) Harmon
Survey of contemporary normative and epistemological issues in public administration theory and practice. Analysis of the past and present influence of logical positivism, behaviorism, humanism, existentialism, and phenomenology

377 **Seminar: Social Action and Public Policy** (3) Catron
Interdisciplinary approach to foundations of public policy, with focus on theoretical problems of social action. Interrelation of theory and practice. Decision and management as human actions.

391 **Substance and Method: Current Topics and Research in Public Administration** (3) Staff
Doctoral students and public administration faculty present papers and engage in discourse based on recent research or research in progress. (Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Public Administration general examination. May be repeated for credit.

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Public Administration candidates. May be repeated for credit.

PUBLIC POLICY—GRADUATE PROGRAMS

Doctoral Committee on Public Policy
A.V. Adams (*Chairman*), E. Berkowitz, C.J. Lange, T.Z. Lavine, W.H. Lewis, J.M. Logsdon, C.E. Rice, C.T. Stewart, P.L. Stewart

The Graduate School of Arts and Sciences offers interdisciplinary programs leading to the degrees of Master of Arts and Doctor of Philosophy in the field of public policy. The master's program allows students to concentrate in one of five policy areas: environmental and resource policy, gerontology, philosophy and social policy, telecommunications policy, or women's studies. The doctoral program, intended for those wishing to pursue

academic or policymaking careers, is concerned with policy research and analysis; students may select an applied field of study in education policy, employment policy, health policy, natural resources and environmental policy, national security policy, and science and technology policy.

Master of Arts in the field of public policy—Required: the general requirements stated under the Graduate School of Arts and Sciences. For specific concentration requirements, consult the Graduate School office.

Doctor of Philosophy in the field of public policy—Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) a pre-qualifying core curriculum consisting of Econ 221–22; Soc 241; PSc 203, 211–12; and one course chosen from PSc 216, 217, or 218; (2) a written qualifying examination; (3) a post-qualifying core consisting of Phil 198, Soc 776, and PPol 201; (4) a minimum of 18 hours related to one of the six policy fields; (5) completion of the tool requirement in two of the following: statistics, computer programming, and historical research methods; and (6) completion of the general examination in the form of a public policy paper.

201 **Seminar in Research Methods and Design** (3) Wirtz
Research methods from an interdisciplinary social science perspective, including model construction, research design, measurement, sampling, data gathering (survey research, content analysis, and aggregate data), and secondary data. Prerequisite: an introductory social science research methods course. (Spring)

231 **Administrative Law and Public Policy** (3) Carrow
An examination of the law-making powers of administrative agencies and the extent to which they are responsible for public policies. Focus on the administrative rule-making function as the most pervasive law-making function of the agencies and on case studies selected from each of the three major areas of administrative power—social welfare, social action, and economic regulation. Offered as the demand warrants

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination.

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit.

RADIOLOGICAL SCIENCES—GRADUATE PROGRAMS

Committee on Radiological Sciences
V.H. Cohn, W.C. Eckelman, C. Paik, R.C. Reba, W.J. Rzeszotarski

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degrees of Master of Science and Doctor of Philosophy in the field of radiological sciences. The program is directed by a committee whose members are drawn from the Departments of Radiology, Pharmacology, Chemistry, and Biological Sciences.

Applicants should have a baccalaureate degree in chemistry, physics, pharmacy, or the biological sciences. Graduate Record Examinations are required for Ph.D. degree applicants and recommended for M.S. applicants. The undergraduate program must have included two semesters each of organic chemistry, physical chemistry, and general biology, and one semester of quantitative analysis.

Master of Science in the field of radiological sciences—Required: the general requirements stated under the Graduate School of Arts and Sciences. The 40 semester hours required for this program must include Rad 190, Bioc 221–22, Phvl 191; Stat 127; RSci 201, 220, 221, 230, 240, and 241, Phar 203, and 6 hours of RSci 299–300.

Doctor of Philosophy in the field of radiological sciences—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study must include Rad 190; Bioc 221–22; Phyl 191; Stat 127; RSci 201, 220, 221, 230,

240, 241, and 250; Chem 235 and 236; and Phar 203. The tool requirements may be met by the satisfactory completion of an approved course in statistics other than Stat 127 and one foreign language or a course in computer programming.

RADIOLOGICAL SCIENCES

201 Nuclear- and Radiochemistry (3)
An introduction to the structure of matter and radioactive decay. Covers concepts of radioactive decay and growth, interaction of radiation with matter, radiation detection and measurement, statistical considerations, tracers in chemical applications, radioactive decay processes, and nuclear models.

220 Radiopharmaceuticals (3)
An introduction to the chemistry and mechanism of action of radiolabeled tracers used in clinical nuclear medicine, including the chemistry of technetium, indium, and the halogens, and radiopharmaceuticals for specific organs and organ systems such as lung, bone, bone marrow, heart, kidney, and liver.

221 Preparation of Radiopharmaceuticals (1)
A laboratory course taught in conjunction with RSci 220, involving the preparation of radiopharmaceutical kits used in clinical nuclear medicine.

230 Radioimmunoassay (2)
A review of the current methods used in radioreceptor assay and radioimmunoassay. Topics include iodination, antisera preparation, separation of bound from free antigen, solid-phase antibody systems, methods involving labeled antibodies, extraction and concentration of hormones from physiological fluids, and mathematical treatment of data and automation.

240 Chromatographic Techniques (3)
An introduction to separation sciences with emphasis on separation equilibria, diffusion and mass transport, operational aspects of separation, chromatography, characteristics of individual separation methods, distillation, gas–liquid chromatography, solvent extraction, liquid–liquid chromatography, crystallization, ion-exchange separation processes, liquid–solid adsorption chromatography, and quality assurance

241 Laboratory: Chromatographic Techniques and Quality Assurance (1)
Laboratory to accompany RSci 240.

250 Seminar in Radiopharmaceutical Chemistry (1)
Invited lectures by research groups in radiopharmaceutical chemistry.

260 Special Topics in Radiological Sciences (2 or 3)
Selected aspects of radiopharmaceutical chemistry. Content differs each time the course is offered. Emphasis on the chemistry of radionuclides at low concentrations.

295 Reading and Research (arr.)
Independent study for students preparing for the Master of Science degree.

299–300 Thesis Research (3–3)
(Fall and spring)

398 Advanced Reading and Research (arr.)
Limited to students preparing for the Doctor of Philosophy general examinations.

399 Dissertation Research (arr.)
May be repeated for credit.

CHEMISTRY

221 *Advanced Analytical Chemistry I* (3)
222 *Advanced Analytical Chemistry II* (2 or 3)
233 *Organometallic Chemistry* (3)
235–36 *Advanced Inorganic Chemistry* (3–3)
251–52 *Advanced Organic Chemistry* (3–3)

257 *Physical-Organic Chemistry* (3)
258 *Synthesis and Structure Determination in Organic Chemistry* (3)

PHYSIOLOGY

191 *Selected Topics in Human Structure and Function* (3)
201 *Physiology* (8)

PHARMACOLOGY

203 *Fundamental Principles of Pharmacology and Toxicology* (3)
256 *Molecular Pharmacology* (2 or 3)
258 *Cancer Chemotherapy* (1)
260 *Endocrine Pharmacology* (1)
269 *Pharmacology Seminar* (1)
275–76 *Advanced Topics in Pharmacology I–II* (1–1)
277–78 *Advanced Topics in Pharmacology III–IV* (1–1)

BIOLOGY

167 *Radiation Biology* (3)
206 *Seminar: Radiation Biology* (3)

BIOCHEMISTRY

221–22 *General Biochemistry* (4–4)

STATISTICS

127 *Statistics for the Biological Sciences* (3)

RELIGION

University Professor S.H. Nasr
Professors R.G. Jones, H.E. Yeide, Jr. *(Chairman)*, D.D. Wallace, Jr., A.J. Hiltebeitel
Associate Professor D.A. Altshuler
Associate Professorial Lecturer E.S. Jospe
Assistant Professor S.A. Quitslund

Bachelor of Arts with a major in religion (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken to satisfy the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.)
2. Prerequisite courses—6 hours from among Rel 9, 10, 59, 60.
3. Four required courses in related areas—(a) 6 semester hours in studies of cultures other than American and English (preferably a foreign language), and (b) 6 semester hours in either literature, philosophy, or history.
4. Required courses in the major—30 semester hours, including at least 21 hours of upper-level courses. Twelve of these hours must be chosen from one of the following religious traditions: Christianity, Hinduism, Islam, and Judaism. Appropriate graduate seminars may be approved as substitutions for advanced-level courses. The program must include Rel 101 and at least one course in each of the following areas: Hebrew Scriptures, New Testament, Eastern religions, Western religions.

An honors thesis course (Rel 191) is available for eligible students.

It is recommended that students include the study of foreign languages in their undergraduate program, including Hebrew for those specializing in Judaism and biblical studies, Greek for those specializing in early Christianity (including the New Testament).

and Sanskrit for those specializing in the religions of India. All students expecting to enter graduate school are urged to study French or German.

Minor in religion—Required: a minimum of 18 semester hours in religion, of which at least 6 must be upper-level courses. The minor program will be developed in consultation with the departmental advisor. Rel 101 is strongly recommended for all participating students.

Master of Arts in the field of religion—Prerequisite: the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Of the 24 semester hours of required courses (exclusive of the thesis), at least 12 must be in third-group religion courses; a maximum of 9 may be in a closely related field outside the Department of Religion as approved by the department. The Master's Comprehensive Examination must cover three fields (the thesis research must be on one of these three fields) selected from the following: the Hebrew Scriptures, the New Testament, history of Christianity, Judaism, history of religion in America, modern religious thought, ethics, sociology of religion, and history of religions. A reading knowledge examination, usually in French or German, is required, however, Hebrew or Greek is acceptable for those students whose thesis area is in the Biblical field and Sanskrit or an Eastern language for those whose thesis area is in the history of religions.

Master of Arts in the field of religious education—Prerequisite: the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree. The undergraduate program should have included the following courses or equivalent: Anth 2; Educ 108; Psyc 1, 22, and 29; CmTr 1 or 11.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Of the 24 semester hours of required courses (exclusive of the thesis), at least 12 must be in third-group religion courses; a maximum of 12 may be in a closely related field outside the Department of Religion as approved by the department.

Master of Arts in the field of religion and medical care—Prerequisite: (1) the degree of Bachelor Arts with a major in religion from this University, or an equivalent degree; (2) a first professional theological degree, or (3) acceptable academic work required of entering medical students who have not earned a bachelor's degree but are pursuing the degree of Doctor of Medicine. Certain courses in this program are offered only through off-campus centers of the Division of Continuing Education and Summer Sessions.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 36 semester hours of approved course work with or without a thesis. Students must elect course work covering four fields selected from clinical pastoral care, religion, sociology, psychology, health services administration, and medicine. The course work in these fields must be distributed as follows: 12 semester hours each selected from two fields and at least 6 hours in clinical pastoral care. The Master's Comprehensive Examination must cover three fields selected from the list above, one of which, as approved by the department, must be outside the Department of Religion. Supervised clinical education may be offered as a tool subject in lieu of the required reading knowledge examination in a foreign language.

Master of Arts in the field of history of religions—Hindurism (Consortium of Universities program)—Prerequisite: the Bachelor of Arts degree from this University with suitable background in the study of religion of South Asia or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 24 hours of course work (exclusive of thesis) selected from upper-division and graduate courses of member universities of the Consortium as determined by the Department of Religion, including a sequence of four courses in the literature of the Hindu tradition and one course in method in history of religions. The Master's Comprehensive Examination must cover the following: method in the study of religions, thematic comparisons between the Hindu tradition and at least two other religious traditions, including at least one Western tradition, and a special field in Hindu tradition. A reading knowledge examination in a foreign language, usually in French or German, will be required, and a student must take at least two semesters of

either Sanskrit or Hindi in addition to the 30 hours of required courses for graduate credit. More complete information regarding courses and requirements is available from the program advisor, Professor A.J. Hiltebeitel, Department of Religion.

Doctor of Philosophy in the field of American religious history (offered in cooperation with the Department of History). Required the general requirements stated under the Graduate School of Arts and Sciences. The General Examination must cover four fields, including two from the Department of Religion (history of religion in America and either early Christianity or European Christianity since 1500) and two from the Department of History (generally American social history and one other).

First Group

9 **The Hebrew Scriptures** (3) Jones
Historical and literary study of the Hebrew Scriptures (Old Testament) with consideration of development of religious ideas, institutions, and outstanding personalities. (Fall and spring)

10 **The New Testament** (3) Jones
Study of New Testament literature from the standpoint of occasion, purpose, dominant ideas, and permanent values. Emphasis on approach, structure, and significance of the Gospels and Epistles. (Fall and spring)

21 **Religion and the Human Search for Meaning** (3) Yeide
Traditional religious concepts, language of contemporary religion amidst modern scientific and secular intellectual tendencies, and the place of religion in today's society. (Fall)

22 **Religion and Contemporary Social Issues** (3) Yeide
Illumination of social problems by ethical reflection; examination of religious perspectives as stimuli and barriers to social change, techniques for maintaining social values and seeking change. (Spring)

23 **Judaism: Identities and Ideas** (3) Altshuler
Exploration of important practices and beliefs in classical and modern times; study of people and texts that confront tradition and background. (Fall and spring)

59 **Religions of the East** (3) Hiltebeitel
Origins, evolution, and contemporary status in historical context of primitive religions, Hinduism, Buddhism, Taoism, Confucianism, and Shinto. (Fall and spring)

60 **Religions of the West and Near East** (3) Quitslund, Wallace
History of religion in the ancient world (e.g., Greece) and of Judaism, Christianity, and Islam, including modern developments. (Fall and spring)

91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course offered by the Departments of East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Political Science, and Religion. A comprehensive and integrated introduction to the civilization and present problems of East Asia. (Spring)

Second Group

101 **Theories in the Study of Religion** (3) Staff
Seminar taught jointly by the faculty of the Department of Religion. Analysis of different ways in which religious phenomena can be approached. Readings and discussion of some of the epoch-making books in the development of the study of religion. (Fall)

103 **The Prophets** (3) Quitslund
Development of the prophetic movement in Israel; cultural, economic, literary, and religious dimensions; elements of lasting value in the prophetic teaching. Study of selected prophets.

104 **The Life and Thought of Jesus** (3) Quitslund
Comprehensive study of the life and teachings of Jesus with critical attention to sources. Quest for the historical Jesus.

105 **The Life and Thought of Paul** (3) Quitslund
Backgrounds of early Christianity, first-century religious and social conditions affecting the spread of Christianity, the life and journeys of Paul, Paul's presentation of the Christian faith. (Spring)

107 **Rabbinic Literature and Thought** (3) Altshuler
Readings of the Mishna, Tosefta, Talmuds, midrashim, and liturgical works in English translation. Methods of literary and historical analysis introduced and applied. Individual research projects. (Fall)

111 **Myth, Epic, and Novel** (3) Hiltebeitel
Religious themes and images of the hero and their cultural significance in literature: e.g., Indo-European, Biblical, Babylonian narrative traditions; Greek epic and drama; Dante, Milton, Dostoevsky, Kafka, Hesse, Faulkner, Beckett. (Fall)

113 **Early Post-Biblical Judaism** (3) Altshuler
History of Judaism from the time of Ezra through the destruction of Jerusalem in 70 CE—canonization of the Pentateuch, Hellenism, Maccabean revolt, growth of sectarian movements, Herod, ferment against Rome in context of Eastern and Western political currents. Use of primary sources, especially the Bible, Josephus, and rabbinic and noncanonical writings.

114 **Judaism in the Rabbinic Period** (3) Altshuler
From 70 CE through end of rabbinic period. Focus on religious responses to destruction of the Temple; apocalyptic thinking and revolt of Bar Cochba; rabbinic and patriarchal responses to Roman authority; Tannaitic and Amoraic Judaism in Palestine and Babylonia; mystical and folk religion phenomena preserved in art and literature.

115 **Judaism in the Medieval World** (3) Altshuler
History of relations between Jews and non-Jews. Daily life and education of the ordinary Jew; rabbinical law and interpretation of scripture; Jewish philosophers, mystics, sects, and messianic movements. (Fall)

116 **Judaism After Emancipation** (3) Altshuler
Transformation of community and beliefs among Jews beginning with catalyst of their political emancipation. Responses to beginnings of modernity among Jews in Europe, America, and Israel. (Spring)

122 **Christian Ethics and Modern Society** (3) Yeide
Nature and principles of Christian life as developed by the Christian community; problems of personal conduct; application to various social institutions.

124 **Contemporary Movements in Theology** (3) Quitslund
Theological approach and systems of a selected number of modern theologians and/or theological movements such as process theology, liberation theology.

126 **Western Mysticism** (3) Quitslund
Study of the phenomenon of religious experience and of selected mystics in Judaism, Christianity, and Islam. (Fall)

127 **Medicine, Religion, and Healing** (1) Yeide
Total care concept. Importance of religion in medical practice for patient and physician. Concept of the professional, the clergy's role in healing, religious perspective on issues in medical ethics. (Spring)

137 **The Land of Israel and the Growth of the Western Religions** (6) Staff

143 **Early Christianity and the Spiritual Life of the Ancient World** (3) Wallace
Rise and development of Christianity in relation to the culture, philosophy, mystery religions, and general religious life of the Greco-Roman world to A.D. 500. (Fall)

144 **Medieval Faith and Symbolism** (3) Wallace
Christian life and thought in the Middle Ages: mystics, saints, popes, and philosophers. (Spring)

145 **Religious Currents in the Renaissance and Reformation** (3) Wallace
Transformation of Western man's understanding of his identity and destiny from the end of the Middle Ages to the Age of Reason.

146 **Christianity from the Enlightenment to Existentialism** (3) Wallace
Changes in Christian life and thought since 1700, as seen in theology, literature, political life, and religious institutions.

155 **Anthropological Approaches to Religion** (3) Simons, Wagner
Same as Anth 155

157 **Indian Philosophy and Mysticism** (3) Hiltebeitel
Indian speculative and mystical traditions: late *Vedas*, *Upanishads*, *Bhagavad Gita*, Buddhist, and Hindu soteriological systems.

158 **Hinduism** (3) Hiltebeitel
Study of continuity and change in Hinduism, with emphasis on historical development and the consolidating features of the religion. Attention to relations between classical and popular living forms. (Fall)

159 **Mythologies of India** (3) Hiltebeitel
The lore of Indian gods (Vedic, Puranic), heroes (epics), and holy men (Hindu, Buddhist, Jain, Tantric), ties with Indian art, caste, cult, cosmology, and spiritual ideals (Spring)

160 **Buddhism** (3) Hiltebeitel
Origin, development, and contemporary status of Buddhist life and thought; its impact on the Near East.

161 **Islam** (3) Staff
Origin, development, and contemporary status of Islamic life and thought; its impact on the Near East. (Spring)

162 **Symbolism in the History of Religions** (3) Hiltebeitel
Religious symbolism, myth, legend, and ritual in the religions of the world; various theoretical analyses (Spring)

165 **Sufism (Islamic Mysticism)** (3) Nasr
The foundation of Sufism in the Quranic revelation, its subsequent development, and its significance within Islamic civilization. Doctrines and practices of Sufism; history of the Sufi orders; Sufi literature, particularly in Arabic and Persian. The influence of Sufism upon social and political life and its state and role in the contemporary world, both Islamic and non-Islamic. (Fall)

172 **Religion in American Culture** (3) Wallace
Growth of religious bodies and institutions in relation to American culture, development of religious thought, and analysis of the contemporary religious scene. (Fall)

174 **American Judaism** (3) Altshuler
Religious thought and institutions with emphasis on contemporary Judaism. Mythic and ritual life of American Jews, including responses to Israel, diaspora, the Holocaust, family and community dynamics. (Spring)

181 **Women in Western Religion** (3) Quitslund
Historical, theological, and ethical investigation of the image and role of women in Judaism and Christianity; special consideration of the Biblical experience, the sexual qualifications for religious office, use of male and female images and languages, and contemporary issues.

183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy
Same as Engl/Fren/Ger/Hist 183 and Art 187.

184 **The Thought of Martin Buber** (3) Jospe
Basic principles underlying the Life of Dialogue and application of those principles to all strata of life from interpersonal relationships to the religious realm.

191 **Senior Honors Thesis** (3) St
Required of and open only to undergraduate honors candidates in religio
(Fall and spring)

Third Group

209–10 **Seminar: Biblical Studies** (3–3) Jon
Main problems of Biblical literary, historical, and theological criticism.
213 **Seminar: Judaism in Late Antiquity** (3) Altshu
Selected topics.
*216 **Supervised Clinical Pastoral Education (I–A)** (6) St
*217 **Supervised Clinical Pastoral Education (I–B)** (6) St
*218 **Supervised Clinical Pastoral Education (III–A)** (6) St
*219 **Supervised Clinical Pastoral Education (III–B)** (6) St
222 **Seminar: Ethics** (3) Yo
Selected topics.
*223 **Religious and Ethical Perspectives on Medical Problems** (3) Yo
*225 **The Dynamics of Ministering to the Young Adult** (3) St
235 **Seminar: Roman Catholicism in the Modern World** (3) Quitslu
Important leaders and their ideas in selected developments since 180
doctrinal, spiritual, biblical, liturgical, and ecumenical. Emphasis on the 20
century.
237 **Seminar: Theological Analysis** (3) Quitslu
Historical and topical study of the development of important ideas in so
areas as Christology, ecclesiology, and death. (Fall)
238 **Seminar: Contemporary Judaism** (3) Altshu
Selected topics. (Fall)
262 **Seminar: History of Eastern Religions** (3) Hiltebe
Selected topics. (Spring)
271 **Seminar: American Religious History to 1830** (3) Walk
Religious thought and life during the Colonial and early National period
273 **Seminar: American Religious History Since 1830** (3) Walk
Religious thought and life from the Civil War to the present.
291–92 **Readings and Research** (3–3) St
Investigation of special problems. (Academic year)
299–300 **Thesis Research** (3–3)
(Fall and spring)

ROMANCE LANGUAGES AND LITERATURES

Professors J.W. Robb, J.A. Frey *(Chairman)*, J.F. Burks
Associate Professors M.A.B. Coffland, P.G. Sáenz, G. Ludlow, S.R. Barnett, I. Azar, J. Thibault
Assistant Professors G.P. Huvé, J.E. Hicks, T.S. Parry
Adjunct Assistant Professors A.-C.J. D'Agostino, C.A. Pauley

Bachelor of Arts with a field-of-study major in (1) French language and literatur Spanish language and literature, (3) Spanish-American literature, or (4) any appro combination selected from two of the preceding fields—The following requirem must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Scien (Students should consult the departmental advisor regarding courses to be taken satisfying the requirements for meaningful initiation into the social sciences and natural and mathematical sciences.)

2. Prerequisite courses—Fren 1–2, 3–4, 9–10, or equivalent; or Span 1–2, 3–4, 9–1 equivalent.

* Offered through the Division of Continuing Education and Summer Sessions at off-c centers for students in the master's degree program in the field of religion and medical Offered as the demand warrants.

3. Required introductory literature courses—Fren 51–52 or 91–92, or Span 51–52 or 91–92.

4. Required for the major.

There is no specific program of required courses. The student, however, is expected to demonstrate a knowledge of his or her field in breadth and depth by passing a comprehensive examination at the end of the senior year. A proseminar is required as follows: Fren 199–200 for French language and literature majors, Span 199–200 for Hispanic language and literature majors.

Minor in French or Hispanic languages and literatures.—Required: 6 semester hours of Fren or Span 51–52 or 91–92. 12 additional hours selected from among French or Spanish courses numbered 9 and above.

Master of Arts in the fields of (1) French literature, (2) Spanish literature, (3) Spanish-American literature, or (4) an approved combination of Spanish and Spanish-American literatures.—Prerequisite: the degree of Bachelor of Arts in the appropriate field from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 24 semester hours of approved course work plus a thesis (equivalent to 6 semester hours), or with the approval of the department, a student may elect a program of study consisting of 36 semester hours of approved course work without a thesis.

Doctor of Philosophy fields of study in Romance literatures.—Required: the general requirements stated under the Graduate School of Arts and Sciences. There are four fields: French literature, Spanish literature, Spanish-American literature; and any approved combination of French, Spanish, or Spanish-American literature.

Bachelor of Arts in Education and Human Development with teaching fields in French and in Spanish.—Prerequisite: the education curriculum, required: the French option or the Spanish option and the professional courses stated under the School of Education and Human Development.

Placement Examinations: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

FRENCH

Departmental prerequisite: Fren 3–4 or 6, or equivalent, is prerequisite to all courses in French, from Fren 9 and above.

First Group

1–2 **First-Year French** (4–4) . . . . . Frev and Staff
(Formerly 3–3 credits)
A year course; credit toward a degree at this University given on completion of Fren 2. Course taught in target language. Pronunciation, conversation, reading, composition, grammar. Laboratory fee, $30 per semester. (Fren 1 and 2—fall and spring)

3–4 **Second-Year French** (3–3) . . . . . Frey and Staff
A year course; credit toward a degree at this University given on completion of Fren 4. Course taught in target language. Intermediate conversation, composition, grammar; readings in extracts from French literature. Fren 3 may be taken separately for 4 credit hours; see the *Schedule of Classes*. Prerequisite: Fren 1–2. Laboratory fee, $30 per semester. (Fren 3 and 4—fall and spring)

6 **Second-Year French** (6) . . . . . Frey and Staff
Lecture (3 hours), discussion (3 hours). Intensive course that covers material of Fren 3–4. Prerequisite: Grade of *B* or better in Fren 2 or departmental placement. Laboratory fee, $30. (Fall and spring)

9–10 **Oral and Written French** (3–3) D'Agostino and
Acquisition of oral and writing skills requisite for effective communica
Different sections of the course are designed to meet the needs of studen
the various schools; see the *Schedule of Classes*. Prerequisite: Fren
equivalent. (Fren 9 and 10—fall and spring)

49 **French for Graduate Students** (0)
For graduate students preparing for reading examinations. No acad
credit. Tuition is charged at the rate of 3 credit hours, plus University C
fee. (Fall and spring)

51–52 **Survey of French Literature** (3–3) Cof
Readings in French literature from the Middle Ages to the present. Lec
and informal discussions. (Academic year)

91–92 **Analyse de texte** (3–3)
Methodology and vocabulary of literary criticism; application of princip
explication de texte to selections from prose, drama, and poetry fro
Renaissance to the present. (Academic year)

Second Group

103 **Oral French With Emphasis on Pronunciation** (3)
The sounds of French; elements of phonetics. Exercises in reading
conversation with attention to accent, rhythm, and intonation. Prerequ
Fren 10. (Spring)

108 **Advanced French Grammar** (3) Thi
Compositions, drills, dictations. Translations into French. Prerequisite:
10. (Fall)

109–10 **Advanced Oral and Written French** (3–3) D'Agostino and
Readings and discussions based on French culture and civilization. Stu
vocabulary and syntax with emphasis on stylistic devices. Oral reports
emphasis on diction. Dictations, translations, compositions. Prerequ
Fren 10 or equivalent. (Academic year)

111 **Advanced French Conversation: The Language of Government, Politics, and Economics** (3)
Discussions and questions based on recent articles from the press. (Sum

119–20 **French Literature of the Middle Ages and the Renaissance** (3–3) D'Ago
Literary history and the development of ideas. *Les chansons de geste*, co
literature, satire, the theater, lyric and didactic poetry; Rabelais, Monta
La Pléiade. Class analysis of texts, collateral readings. (Academic y

121–22 **17th-Century French Literature** (3–3)
Drama, fiction, poetry, criticism, and philosophy in the Age of Classici
(Academic year)

123–24 **18th-Century French Literature** (3–3) Lu
Fren 123: Study of the major novelists and dramatists of the period. Fren
The contribution of Montesquieu, Voltaire, Diderot, and Rousseau to Eu
an and American thought of the period.

125–26 **19th-Century French Literature** (3–3)
Poetry, drama, the novel, and criticism of the 19th century; emphas
stylistic analysis. (Academic year)

127–28 **20th-Century French Literature** (3–3) Coffland, Thi
Fiction, poetry, and drama from 1900 to the present. Chronological exa
tion of authors and movements.

130 **Correspondences Between Art and Literature** (3) Thi
Expression of common preoccupations in diverse media. Readings,
lectures, and informal discussions. Topic to be announced in the Sched
Classes. May be repeated for credit. (Summer)

133 **Seminar: French Literature** (3)
Topic to be announced in the *Schedule of Classes*. May be repeate
credit. (Spring)

151 **Cinema and Literature** (3) Thibault
Interaction between film and literature: aesthetic theories and their applications to film and literary genres. Selected films and readings. May be repeated for credit. (Summer)

183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy
Same as Engl/Ger/Hist/Rel 183 and Art 187.

199–200 **Proseminar: Readings for the Major** (3–3) Thibault
Required of all majors. Conferences and group discussions. (Academic year)

Third Group

202 **Thème et version** (3) Staff

213 **Medieval French Literature** (3) Staff

214 **Seminar: Special Topics in Medieval French Literature** (3) Staff

221 **Special Problems in 16th-Century French Literature** (3) Burks, D'Agostino
Topic to be announced in the *Schedule of Classes*. May be repeated for credit.

229–30 **Literary Renaissance in Europe** (3–3) Burks
Study of the developments in the poetry of Italy, France, and England.

231–32 **Theater in the 17th Century** (3–3) Burks
Survey of the development of theatrical arts and the drama. Research papers and reports

234 **17th-Century Prose Writers** (3) Ludlow
Study of the novel, and philosophical writings of the Baroque and Classical periods. (Fall)

241 **The Age of Enlightenment in Europe** (3) Ludlow
The contribution of the philosophes to the intellectual evolution of France and Europe. Emphasis on the relations among French, English, and German thought. Readings in English and French. Specific topics to be announced in the *Schedule of Classes*. May be repeated for credit.

242 **Seminar: The French Novel and Theater in the 18th Century** (3) Ludlow
Major 18th-century French novelists and dramatists and a comparison of their work with that of some English and German writers of the period. Readings in English and French.

244 **Special Problems in 18th-Century French Literature** (3) Ludlow
Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Spring)

253 **Special Problems in 19th-Century French Literature** (3) Frey, Thibault
Topics to be announced in the *Schedule of Classes*. May be repeated for credit. (Spring)

264 **Seminar: Modern Period** (3) Coffland, Thibault
Topic to be announced in the *Schedule of Classes*. May be repeated for credit.

265 **20th-Century French Theater** (3) Coffland
Avant-garde in the late 19th and the 20th centuries. (Fall)

266 **20th-Century French Poetry** (3) Coffland
Background and development of poetry in the 20th century: *explication de texte* approach.

270 **Seminar in Literary History** (3) Staff
Topic to be announced in the *Schedule of Classes*. May be repeated for credit.
Same as Span 270. (Fall, odd years)

295 **Independent Reading and Research in French Literature** (arr.) Staff
For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

George Washington University is a member of the Folger Institute of Renaissance an 18th-century Studies. Institute policies are set by a central committee on which eac member institution is represented. Doctoral students enrolled in one of the Institut seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbere 301–12. Students wishing to register for these courses should consult the chairman of th Department of Romance Languages and Literatures.

301–12 **Folger Institute Seminars** (3) Sta
Topics will be announced in the *Schedule of Classes*. May be repeated f credit provided the topic differs.

398 **Advanced Reading and Research** (arr.) Sta
Limited to students preparing for the Doctor of Philosophy general examina tion. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Sta
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ITALIAN

First Group

1–2 **First-Year Italian** (4–4) Coffland and Sta
(Formerly 3–3 credits)
A year course; credit toward a degree at this University given on completio of Ital 2. Course taught in target language. Pronunciation, conversation reading, composition, grammar. Laboratory fee, $30 per semester. (Acade mic year)

3–4 **Second-Year Italian** (3–3) Coffland and Sta
A year course; credit toward a degree at this University given on completio of Ital 4. Course taught in target language. Conversation, composition grammar; reading of modern Italian prose, introduction to Italian civilization Prerequisite: Ital 1–2. Laboratory fee, $30 per semester. (Academic year

9–10 **Oral and Written Italian** (3–3) Coffland and Sta
Prerequisite: Ital 4 or equivalent and permission of instructor. (Academi year)

Third Group

295 **Independent Reading and Research in Italian Literature** (arr.)
For students preparing for the Master of Arts or Doctor of Philosophy degre May be repeated for credit. (Fall and spring)

PORTUGUESE

First Group

1–2 **First-Year Portuguese** (4–4) Sta
A year course; credit toward a degree at this University given on completio of Port 2. Course taught in target language. Pronunciation, conversation reading, composition, grammar. Laboratory fee, $30 per semester. (Acade mic year)

31–32 **Intensive Portuguese** (3–3) Rob
Prerequisite: knowledge of one other Romance language.

SPANISH

Departmental prerequisite: Span 3–4 or 6, or equivalent, is prerequisite to all course in Spanish, from Span 9 and above.

First Group

1–2 **First-Year Spanish** (3–3) Barnett and Staff
A year course; credit toward a degree at this University given on completion of Span 2. Course taught in target language. Pronunciation, conversation, reading, composition, grammar. Laboratory fee, $30 per semester. (Span 1 and 2—fall and spring)

3–4 **Second-Year Spanish** (3–3) Parry and Staff
A year course; credit toward a degree at this University given on completion of Span 4. Course taught in target language. Conversation, composition, grammar; reading selections from Hispanic literature. Span 3 may be taken separately for 4 credit hours; see the *Schedule of Classes*. Prerequisite: Span 1–2. Laboratory fee, $30 per semester. (Span 3 and 4—fall and spring)

6 **Second-Year Spanish** (6) Parry and Staff
Lecture (3 hours), discussion (3 hours). Intensive course that covers material of Span 3–4. Prerequisite: grade of *B* or better in Span 2 or departmental placement. Laboratory fee, $30. (Spring)

9–10 **Oral and Written Spanish** (3–3) Sáenz and Staff
Acquisition of oral and writing skills requisite for effective communication. Different sections of the course are designed to meet the needs of students in the various schools; see the *Schedule of Classes*. Prerequisite: Span 4 or equivalent. (Span 9 and 10—fall and spring)

12 **Spanish Conversation and Composition (Intensive)** (6) Sáenz and Staff
Intensive, accelerated course that covers the material of Span 9–10. (Fall and spring)

20 **Prensa y Cultura: Intensive Spanish Conversation** (3) Azar
Intensive conversation organized around specific contemporary topics; illustrated by periodical material, films, and interviews. (Summer)

49 **Spanish for Graduate Students** (0) Hicks
For graduate students preparing for reading examinations. No academic credit. Tuition is charged at the rate of 3 credit hours, plus University Center fee. (Fall and spring)

51–52 **Survey of Spanish Literature and Civilization** (3–3) Barnett, Pauley
Social, artistic, and cultural background of Spanish literature. Lectures, readings, recitations, and informal discussions. (Academic year)

91–92 **Explicación de Textos** (3–3) Sáenz
Analytical introduction to Spanish and Spanish-American literature. Method demonstrated and practiced on selected passages. (Academic year)

Second Group

103 **Spanish Phonetics and Pronunciation** (3) Parry
Intensive study of the sound structure of Spanish. Elements of articulatory phonetics, phonetic symbolism, and transcription. Exercises in reading and conversation, with particular attention to the sound shape of vowels and consonants as well as stress, rhythm, and intonation. Prerequisite: oral proficiency in Spanish at the level of Span 10. (Summer)

109–10 **Advanced Spanish Conversation and Composition** (3–3) Sáenz
Development of writing and speaking skills. Emphasis on diction, grammar, and style. Prerequisite: Span 10 or equivalent. (Academic year)

119–20 **Medieval Spanish Literature** (3–3) Azar
Survey by genre of the literature of the Middle Ages.

121–22 **Spanish Literature of the Golden Age** (3–3) Azar
Span 121: Poetry and drama. Span 122: Prose. (Academic year)

123–24 **Cervantes: *Don Quijote*** (3–3) Azar
The *Quijote* and the novel as a literary genre: reality and fiction.

125–26 **Modern Spanish Literature** (3–3) Barnett
Prose, poetry, and drama of the 18th and 19th centuries. Class analysis of texts, collateral readings, lectures on literature and history.

127–28 **Contemporary Spanish Literature** (3–3) Sa
Prose, poetry, and drama of the 20th century. Class analysis of texts, collate readings, lectures on literature and history. (Academic year)

131 **19th-Century Spanish Theater** (3) Ha
Analysis of Romantic and Realist theater of Spain during the nineteen century. (Summer)

151–52 **The Spanish-American Novel** (3–3) Ro
Development of the novel in Spanish America. Lectures, collateral readin and class analysis of texts.

155–56 **Spanish-American Literature to 1880** (3–3) Ro
Literature of Spanish America from the colonial period to the latter part of 19th century. Lectures, collateral readings, reports, and class analysis important works.

157–58 **Spanish-American Literature Since 1880** (3–3) Ro
Literature of Spanish America from 1880 to the contemporary peri Lectures, collateral readings, reports, and class analysis of important wor

199–200 **Proseminar: Readings for the Major in Hispanic Language and Literatures** (3–3) Barnett and St
Required of all majors. Conferences and group discussions. (Academ year)

Third Group

215 **Seminar: Medieval Language and Literature** (3) St
221 **Seminar: Cervantes' *Don Quijote*** (3) Az
Cervantes' literary theories, the *Quijote* and its relations with the oth *novelas cervantinas* as different modes of representing reality in litera fiction.

224 **Seminar: *La Celestina*** (3) Az
225–26 **Seminar: Special Problems in Golden-Age Literature** (3–3) Az
Topic, fall—16th-century literature; spring—17th-century literature. May repeated for credit provided the topic differs. (Alternate academic yea

231 **Seminar: 18th-Century Spanish Writers** (3) Su
Lectures and analysis of principal authors and works; relationships wi subsequent literary movements.

242 **Special Problems in 19th-Century Spanish Literature** (3) Su
(Formerly Seminar: Spanish Romanticism)
Topic to be announced in *Schedule of Classes*. May be repeated for credi

244 **Seminar: Naturalism and the Spanish Novel** (3) Barn
Development of Naturalism in 19th-century Spain. Analysis of representati works of Pardo Bazán, Clarín, Blasco-Ibañez, and others.

246 **Seminar: Works of Galdós** (3) Barn
Ideological and stylistic analysis; relationship of Galdós' works to litera movements of the second half of the 19th century.

248 **Seminar: Spanish Lyric Poetry of the 20th Century** (3) Sáe
Stylistic analysis of the most significant poets from 1898 to the present.

250 **Seminar: Novecentismo y Literatura de Entreguerras** (3) Sáe
The prose writers: intellectualism and new forms of expression. (Sprin

251 **Seminar: Works of Unamuno and Ortega y Gasset** (3) Sáe
Study of the thought of Unamuno and Ortega y Gasset; analysis an commentary on the texts. (Fall)

252 **Special Problems in Post-Civil War Spanish Literature** (3) Sáe
Development of the Spanish novel since 1939. May be repeated for cre provided the topic differs.

253 **Seminar: Studies in Modern Spanish-American Poetry** (3) Ro
Poetic trends studied in selected poets and groups of poets from th Modernists through Postmodernists and Vanguardists to the present.

255 **Seminar: Studies in 20th-Century Spanish-American Theater** (3) Robb
Trends in modern theater with emphasis on Mexico, Central America, Puerto Rico, Chile, and the Rio de la Plata area.

256 **Seminar: Studies in Mexican Narrative Prose** (3) Robb
Study of the emergence and development of the "New Mexican Narrative" through the works of Yáñez, Rulfo, Arreola, Fuentes, Leñero, and others.

261 **Seminar: Studies in the Spanish-American Short Story and Essay** (3) Robb
The Spanish-American short story and essay as artistic forms; selected modern short story writers and essayists. (Fall)

264 **Seminar: Studies in Recent Spanish-American Fiction** (3) Robb
The "New Spanish-American Narrative" studied in the novels and short stories of Borges, Bioy Casares, Cortázar, Vargas Llosa, García Márquez, Carpentier, Cabrera Infante, and others.

266 **Seminar: Alfonso Reyes: Essayist, Poet, Narrator** (3) Robb
A study of the various prose and poetic works of Alfonso Reyes. (Spring)

270 **Seminar in Literary History** (3) Staff
Topic to be announced in *Schedule of Classes*. May be repeated for credit. Same as Fren 270. (Fall, odd years)

287 **Seminar: Problems in Latin-American Civilization** (3) Staff
Same as Anth/Econ/Geog/Hist 287, and PSc 285.

295 **Independent Reading and Research in Spanish and Spanish-American Literature** (arr.) Staff
For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

SANSKRIT

See **Germanic Languages and Literatures.**

SERBO-CROATIAN

See **Slavic Languages and Literatures.**

SERVICE-LEARNING PROGRAM

Assistant Professors H. Nashman, N.C. Garner, G.J. Povar, P.M. Palmer, H.B. Wagner (*Coordinator*)
Instructor P. Aron

151 **Urban Legal Services** (6) Aron
Field work combined with academic study of major concepts and issues underlying the urban legal system. Field placements (16–20 hours per week) in appropriate law-related organizations. Admission by permission of instructor. (Fall and spring)

152 **Issues in Education and Human Services** (6) Nashman
Exploration of the effects of education on society and vice versa; opportunities for experience, study, and service (16–20 hours per week) in public,

private, museum, hospital, and community education centers. Admission b permission of instructor. (Fall and spring)

153 **Issues in American Health Care** (3 or 6) Pow
Field work combined with academic study of present American health ca system and its problems: cost, quality of care, delivery of health care, ethi issues, health education, consumer issues, etc. Field placements (16–2 hours per week) in appropriate health-related activities. Admission b permission of instructor. (Fall)

154 **Independent Study** (3 or 6) Wagn
Field work combined with academic study, involving field placements an complementary academic program of study, under the supervision of a appropriate faculty member. Students must "contract" with the agency, th faculty member, and the Service-Learning Program. Admission by permissio of instructor. (Fall and spring)

155 **Issues in Managing the Arts** (6) Garm
Studies in the purpose and operation of the arts organizations in Washingto Weekly seminars and placement in an internship in an arts organization (16 20 hours per week). Discussion topics focus on the process of communicatio between artists and the public, the government, and the business community Open to students with a demonstrated interest in the arts and the maturity t perform in a responsible position in an arts organization. (Spring)

156 **InterFuture: Independent Study Abroad** (15) Nimé
Comparative research in the U.S. and one or two other countries included i the InterFuture program. InterFuture scholars are selected on the basis o academic record and aptitude for independent research in a foreign environ ment. Enrollment limited to SPIA juniors. (Spring)

159 **Women and Public Policy** (6) Palm
Field work combined with academic study of policy issues affecting women Field placements (16–20 hours per week) in local and national women's organizations that work to influence public policy. Admission by permissio of instructor. (Fall and spring)

700 SERIES—COURSES IN GENERAL AND INTERDISCIPLINARY STUDIES

Three sets of course numbers have been designated to identify new courses sponsored by this program in Columbian College, the School of Education and Human Development the School of Engineering and Applied Science, the School of Government and Business Administration, the Graduate School of Arts and Sciences, the School of Medicine and Health Sciences, the National Law Center, and the School of Public and International Affairs.

701 (General Studies)
721 (Interdisciplinary Studies)
770s (University Professors)

700 Series courses change frequently; interested students should consult the *Schedule of Classes* for the current semester. The courses are listed with the other offerings of participating departments; course descriptions appear in the section on the 700 series.

The 701 number designates courses taught by individual faculty members. They explore topics not normally included in departmental offerings or utilize insights and methods from disciplines in addition to those usually identified with the sponsoring department. The 721 number designates courses in which faculty from two or more departments investigate a topic of mutual academic interest. Courses numbered in the 770s are taught by scholars who hold appointments as University Professors. The program is coordinated by the Assistant Vice President for Admissions and Student Records.

SINO-SOVIET STUDIES

See **Institute for Sino-Soviet Studies.**

SLAVIC LANGUAGES AND LITERATURES

Professors C.A. Moser *(Chairman)*, N.N. Natov, W.W. Rowe *(Research)*
Associate Professors G.A. Olkhovsky, I. Thompson
Assistant Professors M.F. Miller, R.M. Robin, E.V. Urevich *(Visiting)*
Assistant Professorial Lecturer S. Ficks

Bachelor of Arts with a major in Russian language and literature (field-of-study or departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Slav 5–6 (preferred), or Slav 1–2, 3–4; or equivalent; and Slav 91–92.
3. Required for the major:

Field-of-study major—By the end of the senior year the student will be expected to have a good command of language skills and a grasp of the fundamentals of Russian structure, as well as a good foundation in Russian literature and culture. The passing of a major examination during the senior year is required. The department provides a proseminar to assist the student in preparation for the major examination.

Departmental major—from 30 to 36 semester hours of course work in the Department of Slavic Languages and Literatures distributed as follows: Language—12–15 hours, including Slav 9–10 and 109–10 or equivalent; Culture and Civilization—6 hours (Slav 161–62). Literature in Russian—6 hours chosen from Slav 141, 142, 151, 152, 186; Literature in English Translation—6–9 hours chosen from second-group courses.

A student who is already proficient in Russian language or literature may, upon passing an appropriate examination, waive any or all of the first-group language or literature courses, as well as up to 6 semester hours of second-group courses.

Bachelor of Arts with a major in Russian literature and culture—in translation (field-of-study)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Slav 47 and 49, or Slav 1–2 and 3–4, or equivalent; and Slav 91–92.
3. By the end of the senior year the student will be expected to have a good grasp of Russian literature and the principles of literary criticism, as well as a general knowledge of Russian culture and history. The passing of a major examination during the senior year is required. The department provides a proseminar to assist the student in preparation for the major examination.

A student who is already proficient in Russian language or literature may, upon passing an appropriate examination, waive any or all of the first-group language or literature courses, as well as up to 6 semester hours of second-group courses.

Master of Arts in the field of Russian language and literature—Two areas of concentration are offered: Russian literature and Russian language.

Prerequisite: the degree of Bachelor of Arts with a major in Russian language and literature or Russian literature and culture—in translation from this University, or an equivalent degree. A student planning a concentration in Russian language must pass a Russian language entrance examination and must have a general knowledge of Russian literature and an acquaintance with Russian history and culture. A student planning a concentration in Russian literature must have a general knowledge of Russian literature, an acquaintance with Russian history and culture, and a general proficiency in the Russian language, as demonstrated by passing a Russian language entrance examination.

Required: the general requirements stated under the Graduate School of Arts and Sciences. All candidates must pass a reading knowledge examination in French, German, or a Slavic language other than Russian; a Russian language proficiency examination upon completion of 15 semester hours of course work; and a Master's Comprehensive Examination. Additional specific requirements are as follows:

Concentration in Russian language: 24 semester hours of approved course work plus a thesis (equivalent to 6 semester hours) or 30 semester hours of approved course work without a thesis. The following courses are acceptable for the satisfaction of these

requirements: Slav 152, 186, 211, 212–13, 215, 218, 220, 225, 241, 242, 257, 290, 295; a
Slav 101–2, 103, with a translation project in consultation with a faculty member.

Concentration in Russian literature: 24 semester hours of approved course work plu
thesis (equivalent to 6 semester hours) or 30 semester hours of approved course wo
without a thesis. Courses must include Slav 212–13 and at least 18 hours of literatur

Bachelor of Arts in Education and Human Development with a teaching field
Russian—Prerequisite: the education curriculum; required: the Russian option and t
professional courses stated under the School of Education and Human Development

Placement Examination: A student who has not been granted advanced standing a
who wishes to continue in college the language begun in high school must take
placement examination before registration. Upon completion of the examination, assig
ment is made to the appropriate course.

First Group

1–2 **First-Year Russian** (3–3) Milk
Beginners' course in fundamentals of grammar and pronunciation. Slav 1
prerequisite to Slav 2. Laboratory fee, $30 per semester. (Academic year

3–4 **Second-Year Russian** (3–3) Milk
Intermediate course in Russian language. Prerequisite to Slav 3: Slav 1–2
two years of high school Russian. Prerequisite to Slav 4: Slav 3. Laborator
fee, $30 per semester. (Academic year)

5–6 **Intensive Beginning Russian** (6–6) Thompson and Sta
Classroom (7 hours), laboratory (1 hour). Beginners' intensive course in th
fundamentals of Russian. Prerequisite to Slav 6: Slav 2 or 5. Laboratory fe
$30 per semester. (Academic year)

9–10 **Third-Year Russian** (3–3) or (6–6) Miller, Robi
Practice in reading, writing, speaking, and listening on a third-year leve
Prerequisite: Slav 4, 6, or permission of instructor. Students receive 3 credit
each semester unless they elect to take the course on an intensive basis, fo
which 6 credits can be earned, with an additional three hours per week o
practice in language skills. (Academic year)

31–32 **Elementary Polish** (3–3) Staf
Beginners' course in the fundamentals of grammar and pronunciation
Prerequisite to Slav 32: Slav 31 or equivalent. Laboratory fee, $30 pe
semester. Offered if enrollment is sufficient.

41–42 **Elementary Serbo-Croatian** (3–3) Staf
Beginners' course in the fundamentals of grammar and pronunciation
Prerequisite to Slav 42: Slav 41 or equivalent. Offered if enrollment
sufficient.

47 **Beginning Russian for Reading** (3) Staf
For undergraduate and graduate students with little or no Russian who wis
to acquire a reading knowledge of the language. No academic credit fo
graduate students. (Summer)

49 **Russian Reading** (3) Staf
Primarily for graduate students preparing for reading examinations. No
academic credit for graduate students. Prerequisite: Slav 47 or equivalent
(Summer)

51–52 **Elementary Bulgarian** (3–3) Mose
Beginners' course in fundamentals of grammar and pronunciation. Prerequi
site to Slav 52: Slav 51 or equivalent. Laboratory fee, $30 per semester
Offered if enrollment is sufficient.

71 **Soviet Civilization** (3) Olkhovsky
Survey of the Soviet Union's past and present development. Lectures
discussion, visual aids—in English. (Fall)

91–92 **Introduction to Russian Literature** (3–3) Mose
Emergence and development of Russian literature and ideas during the 19th
and early 20th centuries—in English. (Academic year)

Second Group

101–2 **Readings in the Soviet Press** (3–3) Ficks
Representative reading and translation of Soviet periodicals and current publications in social sciences. Prerequisite: Slav 4, 6, 49, or permission of instructor.

103 **Scientific Russian** (3) Ficks
Representative readings in the major fields of Russian contemporary scientific literature. Prerequisite: Slav 4, 6, 49, or permission of instructor.

109–10 **Fourth-Year Russian** (3–3) Robin
Practice in reading, writing, speaking, and listening on a fourth-year level. Prerequisite: Slav 10 or permission of instructor. (Academic year)

125 **Special Problems in Russian** (3) Staff
Study of selected areas of Russian language, with emphasis on practical use. Prerequisite: two years of Russian or permission of instructor.

128 **Dostoevsky: The Man and the Artist** (3) Natov
Sources and development of Dostoevsky's philosophical, religious, and aesthetic ideas. His influence on Russian and western literature. Lectures, discussions, and reports—in English.

141 **Readings in 19th-Century Russian Prose** (3) Rowe
Reading of representative prose texts of the 19th century—in Russian. Prerequisite: Slav 4 or 6, or equivalent. (Fall, even years)

142 **Readings in 19th-Century Russian Poetry** (3) Rowe
Reading of representative lyric poetry of the 19th century—in Russian. Prerequisite: Slav 4 or 6, or equivalent. (Spring, odd years)

143–44 **The Russian Novel** (3–3) Moser
Study of representative novels of the 19th and 20th centuries—in English.

151 **Readings in 20th-Century Prose and Poetry** (3) Rowe
Reading and discussion of representative prose and poetry of the 20th century—in Russian. Prerequisite: Slav 4 or 6, or equivalent. (Fall, odd years)

152 **Russian Drama** (3) Natov
Readings of the most representative plays of the 19th and 20th centuries. Reports and class discussion—in Russian. Prerequisite: Slav 4 or 6, or equivalent. (Spring, even years)

153–54 **Russian Writers** (3–3) Staff
Reading and discussion of works of outstanding Russian writers of the 19th and 20th centuries—in English.

156 **Loo Tolstoy: His Life and Works** (3) Rowe
Evolution of Tolstoy's artistic and philosophical ideas. Tolstoy's impact on Russian literature and society. Lectures, reports, and classroom analysis of his major works—in English.

161–62 **Russian Culture** (3–3) Olkhovsky
Survey of Russian cultural heritage from origins of ancient Russia to present—in English. Lectures, discussion, reports. (Academic year)

165 **Modern Russian Literature from the Revolution to World War II** (3) Natov
Basic themes, trends, and literary figures of the 1920s and 1930s. The impact of the revolution and civil war on writers and literature. Lectures, discussions, reports—in English. (Fall)

166 **Modern Russian Literature from World War II to the Present** (3) Natov
Literature in wartime and in postwar years. The "thaws," new generation of writers, and new trends in literature of the 1960s, 1970s, and 1980s. Lectures, discussions, reports—in English. (Spring)

186 **The Russian Short Story** (3) Natov
Development of the Russian short story since 1800. Lectures, reports, and class discussion—in Russian. Prerequisite: Slav 9–10 or equivalent. (Spring, odd years)

199–200 **Proseminar: Readings for the Major** (3–3) Staff
Conferences and group discussions. (Academic year)

Third Group

211 **Russian Phonology** (3) Robin
Linguistic analysis of the phonology of standard contemporary Russian. An appropriate knowledge of Russian is required.

212 **Russian Syntax I** (3) Thompson
Linguistic analysis of the verb system of standard contemporary Russian. Lectures, discussion, independent research—in Russian. (Fall)

213 **Russian Syntax II** (3) Thompson
Linguistic analysis of various syntactic problems in standard contemporary Russian. Lectures, discussion, independent research—in Russian. (Spring)

214 **Methodology of Teaching Russian** (3) Thompson
Survey of modern methods, techniques, and materials for teaching Russian as a foreign language. Examination of textbooks, classroom observation, practice teaching. Prerequisite: 18 semester hours of Russian language.

215 **Russian Historical Grammar** (3) Robin
An analysis of the historical development of Russian phonology, morphology, and syntax. An appropriate knowledge of Russian is required. (Fall, odd years)

218 **History of the Russian Literary Language** (3) Moser
The development of the norms of the Russian literary language from earliest times to the present. An appropriate knowledge of Russian is required. (Spring, even years)

220 **Russian Stylistics** (3) Natov
Analysis of various styles of contemporary Russian from the point of view of vocabulary and structure—in Russian. (Spring, odd years)

224 **Russian Literature to 1800** (3) Moser
Survey of Russian literature from the earliest times to the end of the 18th century. Appropriate knowledge of Russian required.

225 **Pushkin and the Poets of his Time** (3) Natov
Pushkin's predecessors: Pushkin's poetry and drama; Lermontov, the heir to Pushkin's poetic tradition— in Russian. (Fall, odd years)

241 **Russian–English Oral Translation** (3) Thompson
Practice in oral translation from Russian into English. Prerequisite: Slav 109–10 or equivalent

242 **Advanced Spoken Russian** (3) Robin
Advanced practice in the spoken Russian language. Prerequisite: Slav 109–10 or equivalent.

254 **Seminar: Literary and Intellectual Currents of the 1860s** (3) Moser
Discussion of literary and intellectual developments in Russia of the 1860s. Appropriate knowledge of Russian required. (Spring, odd years)

255 **Seminar: Main Trends in 20th-Century Russian Literature** (3) Natov
Study of representative works since 1900; their artistic and social value—in Russian. (Fall, even years)

257 **Seminar: The 19th-Century Novel** (3) Natov
Reading and analysis of selected examples of the Russian novel of the 19th century (Dostoevsky, Tolstoy, Turgenev)—in Russian. (Spring, even years)

290 **Special Topics in Russian** (3) Staff
Topics in Russian literature or linguistics. May be repeated for credit.

295 **Independent Reading and Research** (arr.) Staff
For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)
(Fall and spring)

SOCIOLOGY

Professors R.W. Stephens, I.H. Cisin, R.G. Brown, T.F. Courtless, Jr., P.H.M. Lengermann, R.A. Wallace, P.L. Stewart *(Chairman)*, P.E. Mott *(Visiting)*
Associate Professor J.L. Tropea
Assistant Professor S.A. Tuch

Bachelor of Arts with a major in sociology (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students must consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)
2. Prerequisite course—Soc 1.
3. Required courses in related areas—12 semester hours in one of the following related social science fields: anthropology, economics, geography, history, political science, or psychology.
4. Required courses in the major—Soc 100, 140-41, 191, and 15 additional semester hours in second-group sociology courses. Soc 101 and 102 are strongly recommended.

Bachelor of Arts with a major in criminal justice (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students must consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)
2. Prerequisite course—Soc 1.
3. Required courses in related areas—Anth 156, Psyc 130 and 154, Phil 142 and PSc 115 are strongly recommended.
4. Required courses in the major—Soc 135, 136, 137, 139, 151 (9 credits), plus three additional second-group sociology courses.

Minor in sociology—A minimum of 15 hours of course work, including Soc 1 and one course chosen from Soc 100, 101, 102, and 140, plus 9 hours of electives in courses at the 100 level or higher. Departmental advising is required.

Master of Arts in the field of sociology—Prerequisite: a bachelor's degree with a major in sociology or in an approved related field.

Required: the general requirements stated under the Graduate School of Arts and Sciences. With the approval of the advisor and of the Admissions Advising Committee, students may elect one of the following programs: (1) at least 24 semester hours of graduate work plus a thesis (equivalent to 6 semester hours), satisfactory completion of a Master's Comprehensive Examination in sociological theory and social research methods, and an oral defense of the thesis proposal; or (2) at least 33 semester hours of graduate course work and satisfactory completion of a Master's Comprehensive Examination in sociological theory, social research methods, and one substantive special field (criminology deviance, occupations organizations, health policy medical sociology, and social inequality aging gender). Fifteen semester hours of elective courses must be interrelated in a logical way to form a subspecialization; 6 hours may be taken outside the department.

In addition to the hours specified above, all candidates must satisfactorily complete Stat 105 or its equivalent. Candidates must select from the graduate sociology courses as follows: 6 hours chosen from sociological theory (Soc 238 and 239 are recommended), 6 hours chosen from social research methods (Soc 230 and 231 are recommended), and 6 hours chosen from one special area (criminology deviance, occupations organizations, health policy medical sociology, and social inequality aging gender). Candidates must also fulfill the tool requirement by passing a reading knowledge examination in one foreign language or by satisfactorily completing the quantitative tool option, Libr 49, or the graduate course work option.

Doctor of Philosophy in the field of sociology—Required: the general requirements stated under the Graduate School of Arts and Sciences. Students must complete from 30 to 36 semester hours of graduate course work and from 12 to 18 semester hours of dissertation research, for a total of 48 hours beyond the master's degree. Students must include in their program of study Soc 230, 231, and another approved social research methods course; Soc 332; and 6 semester hours of graduate course work in sociological theory and in two substantive specialties, at least one of which must be chosen from among those offered by the Department of Sociology—criminology/deviance, occupations/organizations, health policy/medical sociology, and social inequality/aging/gender. Students must satisfactorily complete the General Examination in sociological theory, social research methods, and two substantive specialties. Students must also fulfill the tool requirement by taking any two of the following options: a reading knowledge examination in one foreign language, the quantitative tool option, Libr 49, or the graduate course work option.

Departmental prerequisite: Soc 1 is prerequisite to all sociology courses except Soc 181.

First Group

1 **Introductory Sociology** (3) Staff
General principles of sociology: development of culture and personality, impact of groups and institutions on man's social behavior. (Fall and spring)

2 **Major Social Issues** (3) Staff
Critical examination of selected social issues in contemporary American society. (Fall and spring)

100 **Major Sociological Perspectives** (3) Lengermann, Wallace
An examination of the development and contemporary content of the major theoretical perspectives guiding sociological work. Theories include functionalism, exchange theory, critical theory, conflict theory, symbolic interactionism, and phenomenology. Prerequisite: Soc 1. (Fall and spring)

Second Group

101 **Development of Social Thought** (3) Lengermann
An exploration of the emergence and growth of sociology from 1800 to 1930, with emphasis on the elaboration of sociological concepts and theories. (Fall)

102 **Modern Sociological Theory** (3) Wallace, Lengermann
(Formerly Soc 149)
Systematic study of contemporary schools of sociological theory, both European and American; evaluation of scientific contributions of each school. Prerequisite: Soc 101. (Spring)

120 **Sociology and Public Policy** (3) Staff
Introduction to concepts, theory, and research illustrating the application of the sociological perspective to public policy.

122 **Selected Cases in Policy Analysis** (3) Staff
Sociological analysis of topical issues in public policy (e.g., education, health, energy, welfare).

124 **Medical Sociology** (3) Stewart, Brown
Social factors and processes related to the etiology and treatment of physical and mental illness; medical occupations and professions, medical organizations, problems of delivery of health care services. (Fall)

125 **Sociology of Religion** (3) Wallace, Yeide
An analysis of the relationships between religion and society. Topics include the emergence of uniquely American religious forms such as civil religion and cultic groups. (Fall, odd years)

126 **Urban Sociology** (3) Staff
The sociological dynamics of the city and of urban growth in the United

States; urban conflict, class conflict, and racism; problems of urban decay, crime and deviance, political competition, and revolt. (Fall)

127 **Population Problems** (3) Stewart
Composition of populations, trends in population growth and population pressure, factors producing population movements, effects of migration, population policies—eugenics and birth control. (Fall)

129 **Race and Minority Groups** (3) Stephens, Tuch
Analysis of relationships between dominant and minority groups in society, particularly in the United States; nature and range of problems; analysis of the phenomenon of prejudice. (Spring)

130 **Class, Status, and Power** (3) Stephens, Brown
Analysis of distribution of resources and opportunities for participation, education, and social mobility in American society; international comparisons; analysis of public policies that affect these distributions. (Fall)

132 **The Family in Modern Society** (3) Stephens
An examination of the stages of family life: birth, childhood, premarital relationships, marriage and sex roles in marriage, retirement and old age. Special emphasis on development and maintenance of interpersonal relations. (Fall)

133 **Socialization and the Life Cycle** (3) Tropea, Wallace
Sociological approaches to the learning of cultural values and behavior from childhood through adolescence and adulthood. Emphasis on the relationship of socialization to selected groups, institutions, social control, and change. (Spring)

134 **Violence and the Family** (3) Tropea
Comparative approach to status, power, force, and violence in family systems. Analysis of devaluation of family relations. Critical survey of explanations of violence and responses made to it. (Fall)

135 **Youth and Delinquency** (3) Courtless, Tropea
Analysis of historical, economic, and social conditions affecting both difficulties in socializing youth and the evolution of the state's formal systems of control. (Spring)

136 **Criminology** (3) Tropea, Courtless
Nature and distribution of crime as related to the development and operation of criminal law and various social and legal institutions in urban society. (Fall)

137 **Sociology of Law** (3) Courtless, Tropea
Law as a social phenomenon and agency of social control. Special emphasis is placed on study of the sources of and challenges to the legitimacy of law. (Fall)

139 **Deviance and Control** (3) Tropea, Courtless
Analysis of the development of primary deviance through processes of socialization; analysis of the creation of secondary deviance through collective definitions and responses within various historical, political, and social contexts. (Spring)

140 **Social Research Methods** (3) Tuch
Introduction to basic research methods in sociology Topics include research design, sampling, measurement, and elementary data analysis via computer application. (Fall)

141 **Advanced Research Methods** (3) Tuch
Continuation of Soc 140. Examination of a range of topics in the statistical analysis of sociological data, with a strong emphasis on computer applications. Prerequisite: Soc 140. (Spring)

143 **Social Movements** (3) Stephens
General survey of the various forms of collective behavior (fads, panics, riots, social movements, etc.), and a more detailed study of the genesis, development, and decay of social movements and social revolutions. (Spring)

151 **Field Experience in Criminal Justice** (9) Courtless, Tro
(Formerly Field Experience in Sociology)
Experientially based learning of the administration of justice through fi
placements in legislative and policymaking domains and in institutions
juvenile and criminal justice. Academic evaluation predicated on indepe
dent readings, research, journals, and seminar participation. Sixteen hours
field work and four hours of seminar required weekly. Admission
permission of criminal justice advisors. (Fall, spring, and summer)

152 **Field Experience in Sociology** (9) (Su
(Formerly 6 credits)
Development of a comprehensive perspective and applied skills in selec
social systems through seminars, readings, research, and field placeme
Requires 16 hours of field work weekly. Recommended for juniors a
seniors. Open to all but majors in criminal justice. Topics include hea
aging, and family. Prerequisite: Soc 1. (Fall or spring)

155 **Gender Roles and Socialization** (3) Wallace, Lengerma
The roles of women and men from social structural and social psychologi
perspectives. Analysis of gender roles in the work force, gender contro
social structures, and how gender roles influence personal identity. (Fa

160 **Death and Dying: A Sociological Perspective** (3) Brown, Stew
Processes of death and dying examined from cross-cultural and natio
perspectives. Topics include considerations of terminal care, abortion, mu
der, funeral customs, genocide, and the depiction of death in literature a
philosophy. (Spring)

181 **Major Social Processes** (3) Sp
Analysis and examination of various processes in society of general imp
tance to the field of sociology, e.g., social conflict, socialization, soc
change. Topic changes each semester; may be repeated for credit. Admissi
by permission of instructor. (Fall and spring)

191 **Current Emphases in Sociology** (3) Sp
Analysis and evaluation of recent developments in the general field
sociology. Required for all sociology majors. (Fall and spring)

195 **Research** (1, 2, or 3) Sp
Independent study and special projects. Open only to selected undergradua
students with promising academic records. Before students are permitted
register for Soc 195, they must submit a written proposal of their plan of stu
for the approval of the staff member of the department who will be directi
the research. (Fall and spring)

Third Group

203 **Social Organization** (3) Sp
Introduction to sociological concepts and perspectives. An examination
empirical studies that utilize different theoretical perspectives. Recommend
ed for students offering sociology as a supporting field. (Fall)

210 **Theoretical Foundations of Political Sociology** (3) Lengerman
Sociological theory on the relationship of politics to the wider social syste
Emphasis on concepts of power, alienation, ideology, political stabilit
conflict, and change.

220 **Seminar: Sociology of Religion** (3) Wallace, Yeid
Analysis of theoretical and empirical approachs to the study of religion as
social phenomenon. Both classical and contemporary contributions will b
examined. Among the topics are secularization, new religious movement
and modes of religious organization. (Spring, even years)

225 **Theories of Social Change** (3) Lengerman
Review of sociological writings on modernity—its emergence in the Nort
Atlantic societies, its consequences for third world societies, and its futur
(Spring)

230 **Sociological Research Methods** (3) Cisin, Tuch
Systematic survey of sociological research strategies and review of the literature in this area. Recommended for students with only one undergraduate course in research techniques. Prerequisite: Stat 105 or equivalent. (Fall)

231 **Seminar: Advanced Research Methods** (3) Cisin, Tuch
Intensive study and evaluation of a few sophisticated research techniques and of new developments in the methodology of social research. Prerequisite: Soc 230, Stat 105, or equivalent. (Spring)

232 **Qualitative Methodology: Doing Field Research** (3) Stewart
Practical application of data collection methods in natural settings: observation, participant observation, and field experience. Emphasis on implementing research projects by using these methods for purposes of developing empirically grounded theory.

235 **Seminar: Sociology of Education** (3) Wallace, Tropea
Sociological theories on relationships between education and the economic, political, social, and cultural character of society; examination of social factors relating to such topics as educational achievement, the changing functions of educational structures, and the roles of teacher and student. (Spring, odd years)

238 **Seminar: Development of Sociological Theory** (3) Lengermann
Development of sociology from the early 1800s to the 1920s. Intensive analysis of the classical theoretical statements. (Fall)

239 **Seminar: Modern Sociological Theory** (3) Lengermann, Wallace
Intensive examination and evaluation of contemporary schools of sociological theory in Europe and America. Advanced analysis of theoretical perspectives. Prerequisite: Soc 238. (Spring)

240 **Sociology of Work and Occupations** (3) Stewart
Review of major theoretical and empirical developments in industrial sociology; varying approaches to the study of work and occupations. (Fall)

241 **Sociology of Work and Organizations** (3) Stewart
Theory of complex organizations relative to work in industry, government, and business; examination of basic processes such as decision making, recruitment, allocation of authority, informal organization, and interorganizational relations. (Spring)

242 **Seminar: Medical Sociology** (3) Stewart
Sociological analysis of cultural, social, and social-psychological factors in occurrence and care of physical and mental illness as they function in the community, the hospital, and in interpersonal relations; study of the social structure of health care services and interplay of the various health professions. (Fall)

254 **Evaluative Research** (3) Staff
Systematic survey of conceptualization, design, and practice of evaluative research of social experiments and of simulation and technological forecasting. (Spring, even years)

256 **Selected Topics in Social Policy Analysis** (3) Staff
A sociological perspective on selected policy areas, including urban planning, education, family, aging, health, affirmative action, law enforcement, and economic development. Particular policy areas will be rotated year by year. Course may be repeated for credit.

*259 **Law and Criminology I: Search for the Causes of Criminal Behavior** (3) Courtless, Tropea
Same as Law 475(2). (Fall)

*261 **Law and Criminology II: Society's Responses to the Criminal Offender** (3) Courtless, Tropea
Same as Law 476(2). (Spring)

* Students registering for Soc 259 or 261 make special arrangements with the instructor for supplementary assignments equivalent to 1 additional semester hour. For description of the courses, see the *National Law Center Bulletin*.

263 **Seminar: Law and Society** (3) Courtless
Selected problems in law as an instrument of social policy; emphasis on the organization of legal decision-making processes. (Summer)

265 **Selected Topics in Criminal and Juvenile Justice Policy** (3) Courtless, Tropea
Development of a systematic perspective on policies affecting the juvenile and criminal justice systems. Topics will include adjudication, disposition, diversion, and sentencing. (Spring, even years)

271 **Seminar: Gender and Society** (3) Lengermann, Wallace
An examination of quantitative and qualitative research in the field of gender with emphasis on current empirical research. (Fall)

280 **The Sociology of Aging** (3) Brown
Impact of current demographic changes (size and composition of the aged population) on the existing structure of American society. (Spring)

281 **Problems of Growing Old in American Society** (3) Brown
Analysis of the bases of the social status of the aged in American society, the impact on older people of characteristic situational changes in later life, and societal responses to those impact areas defined as social problems. (Fall)

290 **Principles of Demography** (3) Staff
Same as Econ 290.

291 **Methods of Demographic Analysis** (3) Staff
Same as Econ 291.

295 **Research** (arr.) Staff
Independent study and special projects. Before permission is granted to register for Soc 295, the student must submit a written plan of study for the approval of the staff member of the department who will be directing the research. May be repeated once for credit. (Fall and spring)

299-300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students and are offered as the demand requires. Other graduate students are permitted at the discretion of the department or the instructor.

332 **Seminar: Processes of Inquiry** (3) Staff
Development and critical review of students' research projects with the objectives of aiding conceptualization and developing research design. Consideration of the interplay between theory and methods. Prerequisite: at least 3 semester hours each of graduate theory and graduate methods. May be repeated for credit.

342 **Advanced Seminar on Health Policy** (3) Stewart
Review of how health policy is made and implemented; how health policy research is done; in-depth review of selected topics and completed policy studies, primarily for students in the medical/health policy field. Prerequisite: Econ 248, Soc 242 or consent of the instructor. (Spring)

351 **Selected Topics in Sociology** (3) Staff
Intensive investigation of special topics in sociological theory. May be repeated for credit. (Fall)

352 **Selected Topics in Sociology** (3) Staff
Intensive investigation of special topics in sociological research. May be repeated for credit. (Spring)

370 **Seminar: Foundations of Social Inequality** (3) Stephens
Review of the principal concepts and theories used to explain social inequality at both macro and micro levels. Examination of principal bases of inequality and their representative forms. (Prerequisite course for students selecting social inequality as a major field.) (Fall)

371 **Seminar: Theoretical Perspectives on Gender** (3) Lengermann, Wallace
Review of significant theoretical writings on gender and gender inequality, with a primary focus on contemporary sociological statements. (Spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

SPANISH

See **Romance Languages and Literatures.**

SPECIAL EDUCATION

Professors R.S. Cottrell, Jr., R.K. Ives, J.R. Shotel
Associate Professors M.S. Castleberry *(Chairman)*, L.A. Tsantis, N.J. Sobel, R.N. Ianacone, A.J. Mazur
Assistant Professor M.B. Freund
Instructors D.M. Hiltenbrand, B.A. Burns

See the School of Education and Human Development for programs of study in special education leading to the degrees of Bachelor of Arts in Education and Human Development, Master of Arts in Education and Human Development, and Doctor of Education.

First Group

57 **Curriculum Development for the Special-Needs Child** (3) Burns
An overview of theory and scope of pre-academic and academic curriculum development as it relates to the special child. (Fall)

58 **Curriculum Adaptation for the Special-Needs Child** (3) Burns
Lectures, demonstration, and experiences designed to develop the student's ability to adapt curriculum and style of presentation to meet the needs of the special child. (Spring)

87-88 **Sign Language and Deafness** (3–3) Staff
Same as Educ 87–88.

100 **Introduction to Special Education** (3) Staff
Survey course to acquaint prospective teachers with special education and to help them become aware of the various educational modifications necessary to accommodate children in a school program. (Fall)

Second Group

101 **Dimensions of the Complementary Teaching Role: Implementation of the Resource Room** (3) Mazur
Instructional experiences designed to refine the insights and competencies essential for successful operation of the complementary teaching model. (Fall)

102 **Practicum: Teaching the Child With Special Needs: Methods and Materials** (3 or 6) Mazur
Laboratory course taught in an elementary public school. Students observe and participate in a demonstration seminar conducted by the instructor. Must be taken concurrently with SpEd 189. Material fee, $50. (Fall)

103 **Practicum: Teaching the Child With Special Needs: Creative Programming** (3 or 6) Mazur
Continuation of SpEd 102. Concentration on the total programming of the child with special needs. Must be taken concurrently with SpEd 190. Material fee, $50. (Spring)

160 **Academic and Psychosocial Assessment of the Elementary-School-Aged Exceptional Child** (3) Mazu
An investigation of the assessment process: theory and scope of psycho educational assessment, informal and formal assessment, clinical experience in informal assessment, application of diagnostic findings to instructional recommendations.

168 **Overview of Handicapping Conditions: Etiology and Symptomatology** (3) Burn
Causes and symptoms of most prevalent handicapping conditions in the mainstreamable child.

170 **Dynamics of Human Relations: Theory and Practice** (3) Mazu
Discussion of psychosocial theory as it relates to successful interaction with children. (Fall)

189 **Preprofessional Internship: Program Adaptation for the Special Needs Child in the Regular Classroom** (3) Mazu
Supervised internship in school setting. Emphasis on intensive study of children with special needs. Must be taken concurrently with SpEd 102. (Fall)

190 **Preprofessional Practicum: Inspecting a Continuum of Special Education Services** (3) Burns
Observation and participation in various special education settings. Emphasis on exposure to and familiarity with goals and programs of various special education models. Must be taken concurrently with SpEd 103. (Spring)

197–98 **Special Study in Special Education** (3–3) Staff
Individual or group study or research under the guidance of staff members. Program and conferences arranged with advisor. Admission by permission of advisor. (Academic year)

199 **Practicum in Complementary Teaching** (6 to 12) Mazu
Supervised teaching internship in a school-based intervention program. Student teaching with children identified as needing special education services. A minimum of 240 clock hours required. Admission by permission of the instructor. (Spring)

Third Group

202 **Psychosocial Development of the Exceptional Child** (3) Staff
The relationship between psychosocial development of the exceptional child and psychosocial development in general. Admission by permission of instructor. (Fall, alternate years)

220 **Selected Topics in Special Education** (3 or 6) Staff
Courses on topics relevant to special educators offered to selected groups.

221 **Accessing Community Systems for the Special-Needs Child** (3) Freund
Overview of access and service delivery for the special-needs child and his or her family. The relationship of public policy to service delivery is considered. (Spring and summer)

222 **Legislative Issues and Concerns in Vocational/Special Education** (3) Ianacone, Hiltenbrand
Issues relating to interpreting and monitoring compliance of legislation designed to address more adequately the needs of secondary-school-level handicapped youth. Emphasis on practical strategies in response to the mandates of P.L. 94-142, P.L. 94-482, and P.L. 93-112. Material fee, $20. (Fall)

229 **Vocational/Special Education Assessment of the Secondary-Level Handicapped Student I** (3) Ianacone
Individual study of methods and materials used in academic assessment, including formal and informal testing to determine achievement, learning styles, process disorders, diagnostic information, behavioral readiness, and functional life skill attainment. Material fee, $20. (Fall)

230 **Vocational/Special Education Assessment of the Secondary-Level Handicapped Student II** (3) Ianacone
Investigation of the vocational assessment process, including formal and informal systems to determine vocational interests, aptitudes, and employability skills. Material fee, $20. (Spring)

231 **Selected Vocational/Special Education Methods and Materials** (3) Hiltenbrand
Selected techniques and materials used in teaching and programming for the secondary-school-level handicapped student in career, academic, and occupational-skill areas. Must be taken concurrently with SpEd 233. Material fee, $15.

232 **Practicum: Counseling Techniques and Strategies for Career and Vocational Special Education** (3) Ianacone, Hiltenbrand
Specific counseling strategies and techniques focusing on career and vocational decision making for handicapped individuals. Emphasis will be placed on combining theoretical constructs with practical field experience. (Fall)

233 **Curriculum for Vocational/Special Education** (3) Hiltenbrand
Examples and practice in designing, implementing, and modifying academic, career, prevocational, and vocational education curriculum for the handicapped. Must be taken concurrently with SpEd 231.

234 **Seminar in Career and Vocational/Special Education** (3) Staff
Weekly seminar dealing with issues, experiences, and concerns associated with field-based program planning, implementation, and evaluation. Must be taken concurrently with SpEd 245. Material fee, $20. (Spring)

235 **Coordination of Job Placement Programs in Vocational/Special Education** (3) Staff
Rationale, resources, and programming strategies for the development and coordination of successful job placement programs for the handicapped.

236 **Secondary Career Planning for the Handicapped** (3) Staff
The ongoing process of career development and vocational preparation for the handicapped. Techniques and resources utilized in conducting career programming for the handicapped.

240 **Developmental Process of Parenting: Parenting the Handicapped Child** (3) Freund and Staff
The developmental process of becoming a parent and ongoing parenting. Particular attention is paid to parenting the handicapped child. Material fee, $20. (Spring)

241 **Practicum: The Liaison Special Educator** (3 or 6) Freund
Theory relevant to the coordinated delivery of services for health handicapped children and their families. Provides practicum opportunities for working with the health-handicapped child. Approximately nine hours per week are spent in a hospital setting and the University classroom. (Fall)

242 **Neurodevelopmental Programming for Handicapped Infants and Toddlers** (3 or 6) Tsantis
Provides students with a theoretical background and practical experience to translate the neurodevelopmental model into techniques for developing and implementing educational programs for handicapped infants and toddlers. Prerequisite: SpEd 268 or permission of instructor. Material fee, $30. (Spring and summer)

250 **Specialized Techniques and Materials: Career/Special Education** (3) Ianacone, Hiltenbrand
Selected materials and techniques in career education, strategies for infusing these concepts into career education programs, and services for handicapped individuals. Admission by permission of instructor. (Fall and spring)

253 **Special Education for Adjudicated Youth: State of the Art** (3) Staff
Seminar offering an overview of special education for adjudicated youth through presentation by theorists and practicing professionals. (Fall)

254 **Special Education for Adjudicated Youth: Field Experiences** (3) Staff
Site visits to local, state, and federal facilities coordinated by a series of seminars tying theory to practice. (Summer)

255 **Academic and Vocational Assessment in Special Education for Adjudicated Youth** (3) Staff
Development of assessment skills with current academic and vocational diagnostic instruments for use with adjudicated youth. Interpretation of interdisciplinary report data. Material fee, $20. (Summer)

256 **Methods and Materials in Special Education for Adjudicated Youth** (3) Staff
Selected materials and techniques for teaching and programming for handicapped adjudicated youth. Emphasis on individualized programming strategies in a variety of correctional settings. (Fall)

257 **Internship in Special Education for Adjudicated Youth** (9) Staff
Full-time field experience with special education for adjudicated youth; bimonthly University seminars. Opportunity to synthesize and integrate total program objectives. (Spring)

260 **Developmental Assessment in Special Education** (3) Tsantis, Castleberry
Lectures, demonstrations, and clinical practice in formal and informal assessment procedures. Admission by permission of instructor. Material fee, $25. (Spring and summer)

261 **Practicum: Methods and Materials for Young Exceptional Children** (3 or 6) Ives, Castleberry
Clinical practice in design and implementation of educational strategies and materials. Three dimensions: designing and developing teaching materials, classroom teaching, feedback and evaluation with professor. Taught at a demonstration site. Requires eight hours a week on site. (Fall)

262 **Formal Assessment of Young Exceptional Children** (3) Castleberry, Tsantis
Weekly seminar designed to prepare early childhood special educators to translate formal assessment data into instructional programming. Requires field work with children. Material fee, $25. (Fall)

263 **The Severely and Profoundly Handicapped Child: Development and Etiology** (3) Staff
Survey of the characteristics and learning patterns of children with severe disabilities. Lecture and field experience. (Fall)

264 **Educational Implications of Medical and Genetic Conditions of the Developmentally Delayed Child** (3) Freund
Specialized programs, techniques, and methods for teaching developmentally delayed children, with emphasis on genetically linked handicapping conditions. Practitioner needs and programming concerns are stressed. Material fee, $25. (Spring)

265 **Clinical Experience With Multiply Handicapped and Developmentally Disabled Young Children** (3) Ives
Field experience designed for students with limited experience in early childhood special education. Three-week intensive involvement in an early childhood special education setting. (Summer)

266 **The Development of Language in Young Exceptional Children** (3) Shotel
Introduction to the study of language acquisition and the development of language programs for the special-needs child. (Summer)

267 **The Early Childhood Special Educator: A Survey of Roles, Services, and Issues** (3) Castleberry
Examination of the spectrum of roles available in early childhood special education; emphasis on the historical, legal, philosophical, and technological aspects of early childhood special education. (Summer)

268 **The Development of the Special-Needs Child** (3) Freund
An in-depth examination of the development of young exceptional children;

and the specific nature of handicapping conditions. Lecture and field visits. (Fall)

269 **Multidisciplinary Theory in Special Education** (3) Castleberry, Ives
Seminar focusing on sociological and psychological constructs relevant to interpersonal/intrapersonal relationships. Material fee, $25. (Fall)

270 **Mainstreaming: Adapting Attitudes, Programs, and Curriculum to Meet the Needs of the Special Child** (3) Staff
Review of the basic curriculum areas as they relate to the development of readiness skills in special education. (Spring, alternate years)

271 **The Interdisciplinary Approach to Planning for the Special-Needs Child** (3 or 6) Freund
Theory of interdisciplinary team functioning. (Spring)

273 **Seminar for Special Education Strategist Intern** (3) Shotel, Tsantis
Weekly seminar dealing with experiences, problems, and concerns encountered during special education/early childhood strategist internship. (Spring)

280 **Developmental Assessment for Adolescents** (3) Sobel
Formal and informal psychoeducational assessment instruments commonly used with upper-elementary and junior and senior high school students, along with the writing of psychoeducational reports. Material fee, $25. (Fall)

288 **Psychoeducational Characteristics of the Seriously Emotionally Disturbed Adolescent** (3) Sobel
An in-depth examination of relevant diagnostic categories, psychosocial development issues, and the nature and needs of the seriously disturbed adolescent. (Fall)

289 **Curriculum Methods for the Seriously Emotionally Disturbed Adolescent** (3 to 6) Ives, Sobel
Design and implementation of appropriate educational and management plans, under the supervision of the instructor in a field-based practicum experience. (Spring and summer)

290 **Control and Management Techniques in the Special Education Classroom** (3) Castleberry, Ives
Examination of the theory, techniques, and tools essential for effective classroom management. (Spring)

291 **Education of the Seriously Emotionally Disturbed Adolescent: Intervention Alternatives** (3) Ives, Sobel
Examination of comprehensive program and specific management strategies. (Spring)

292 **Professional Internship in Education of Young Exceptional Children** (6 or 9) Ives, Tsantis
Supervised internship in the education of young exceptional children. A minimum of 420 clock hours required. (Spring and summer)

293 **Professional Internship for the Special Educator** (6 to 9) Freund, Tsantis
Supervised internship in the multidimensional aspects of work within the special education continuum. (Spring and summer)

294 **Professional Internship: Service to the Seriously Emotionally Disturbed Adolescent** (6 to 9) Ives, Sobel
Full-time placement as a psychoeducator in a residential or extended day-care site. (Spring)

295 **Professional Internship in Supportive Training, Transition, and Education Programs** (6 to 9) Ianacone, Hiltenbrand
Supervised internship focused on providing supportive training, transition, and education experiences for handicapped individuals. Emphasis on diversified cooperative and interagency programming efforts. Internship experiences will be individualized for career, adjudicated youth, and vocational special education candidates; 280–420 clock hours required. Must be taken concurrently with SpEd 234. (Spring)

296 **Philosophical, Legal, and Practical Issues in the Implementation of Public Law 94-142** (3) Shote
Historical and legal perspectives that have led to Public Law 94-142, th Education for All Handicapped Children Act of 1975, and the consequence of this act on public school service delivery systems. Emphasis on the presen and future impact of this law and its interpretation on the regular clas teacher and administrator and on their roles within a public school system (Summer)

297–98 **Individual Study in Special Education** (3 or 6 each) Staf
Individual study or research under guidance of staff member. Program an conferences arranged with advisor. Admission by permission of advisor. Ma be repeated for credit. (Academic year)

303 **Administration and Supervision of Special Education** (3) Ives, Castleberry
Philosophy and nature of special education; program organization, adminis tration, and development. Surveying local needs; program evaluation an supervision. Admission by permission of instructor. (Summer)

304 **Recent Research and Trends in Special Education** (3) Tsantis, Ianacon
Emphasis on topical research issues and concerns, unique problems o conducting research, and procedures and sources for obtaining researc funding. Material fee, $25. (Fall and spring)

306 **Dynamics of Family Intervention: Theory and Practice in Special Education** (3) Ive
Theoretical foundations and clinical techniques necessary for the earl childhood special educator to counsel successfully parents of handicapped children. Material fee, $25. (Spring)

308 **Instructional Processes in Special Education: The Trainer of Trainers** (3) Ive
Review of the instructional processes as they affect education and specia education, including the university and staff development perspective; op portunities for practice in needs assessment, program design, and actua instruction. Admission by permission of instructor. (Fall)

343 **Psychoeducational Diagnosis of Children With Behavior or Learning Difficulties** (3) Tsantis and Staf
The range of diagnostic strategies applicable to the child who presents psychosocial and related learning difficulties. Admission by permission o instructor. (Spring)

345 **Consultation Skills in Special Education** (3) Ives, Shote
Consultation models from organizational development, organizational psy chology, and mental health applied to in-service training for educationa personnel and facilitating appropriate programs for the special child in the public schools. (Spring)

350 **Child Identification and Assessment: The Process of Planning Appropriate Educational Intervention** (3) Staf
Exposes administrators/supervisors to information relative to the exceptiona child. Examines etiologies and symptomatologies of handicapping condi tions, developmental norms, identification and assessment strategies, and individualized educational programming.

351 **Seminar: Developing Home/School/Community Support Systems—Models for Effective Service Delivery** (3) Ives, Sobe
Provides experiences that facilitate effective service planning for the handi capped child through the examination of existing models of family interven tion, curriculum adjustment, and special education service delivery. (Spring

352 **Seminar: Legal Issues and Public Policy Concerns in Planning Service Access for the Special Child** (3) Staf
Reviews the responsibilities of their existing roles with regard to require ments generated by the legislative and judicial branches of the government (Summer)

360 **Interdisciplinary Techniques in the Diagnostic Process in Special Education** (3) Tsantis, Freund
Application of theoretical concepts of assessment; development of assessment programs; interpretation and application of interdisciplinary diagnostic evaluations. Prerequisite: SpEd 260 or equivalent, and permission of instructor. (Fall)

370 **Attitude Change and the Access Process for the Special Child: Individual Ability to Change** (3) Ives
Applies specific psychosocial constructs germane to successful human interaction to the professional milieu of the special education consultant administrator. Material fee, $20. (Fall)

Fourth Group

401 **Doctoral Mini-Seminar in Special Education** (3) Staff
Participation in a small group with a selected faculty member; intensive study and discussion of an area of common interest in an informal environment providing for the exchange of ideas and optimum potential for personal and professional growth. Admission by permission of instructor. (Spring)

453–54 **Doctoral Internship: Special Education** (6–6) Staff
Supervised professional internship in college teaching, administration, supervision, or private agency function. Each internship individually arranged. Admission by permission of advisor. (Academic year)

480 **Evaluation in Special Education** (3) Shotel
Application of educational evaluation models to special education situations. Special consideration given to the work of Haines, Popham, Scriven, Stake, Stufflebeam, Taba, and Tyler. Practical application of the theoretical models will be stressed. (Fall)

490 **Departmental Seminar in Special Education** (3) Shotel
Provides an opportunity for selected graduate students to develop, refine, and demonstrate their skills and abilities in a small-group setting with fellow students and department faculty. Admission by permission of instructor. (Fall)

491 **Dissertation Research** (arr.) Staff

SPEECH AND HEARING

Professors J.W. Hillis, L.S. Bowling *(Chairman)*, L.S. Bielski, G.R. Herer, C.W. Linebaugh
Associate Professors M.D.M. Brewer, J.R. Regnell
Assistant Professors C.E. Scala, S.L. Murray

Bachelor of Arts with a non-professional major in speech-language pathology and audiology (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation in the humanities and the natural and mathematical sciences.)
2. Prerequisite courses—CmTr 1, SpHr 11.
3. Required courses in related areas—Psyc 115, 121, and 131 (or their equivalent), plus 15 additional semester hours of second-group courses selected from related areas as approved by the major advisor.
4. Required courses in the major—SpHr 101, 102, 103, 104, 108, 118, 119.

Minor in speech and hearing—15 semester hours are required, including SpHr 11, 101, 103, and at least 6 semester hours of second-group courses to be selected from SpHr 102, 104, 108, 118, and 119.

Master of Arts in the field of speech–language pathology and audiology—Prerequisite: the degree of Bachelor of Arts with a major in speech–language pathology and audiology from this University, or an equivalent degree, and an appropriate score on the Aptitude Test of the Graduate Record Examination.

Required: the general requirements stated under the Graduate School of Arts a Sciences. The program of study consists of 36 semester hours of approved course wo without a thesis or, with the approval of the department, 24 semester hours of approv course work plus a thesis (equivalent to 6 semester hours). All students must satisfy academic and supervised practicum requirements of the Certificate of Clinical Comp tence awarded by the American Speech–Language–Hearing Association.

All students must take the National Examination in Audiology or in Speech Patholo available through the Educational Testing Service. Students must request the Test Service to send copies of the test scores to the Department of Speech and Hearing to used in the fulfillment of the general requirement in the Graduate School of Arts a Sciences for the Master's Comprehensive Examination. Satisfactory test results mu reach the department at least three weeks before graduation. In the event that t National Examination is not available, the Speech and Hearing Department mu substitute its own examination.

Speech and Hearing Therapy: See the Speech and Hearing Center.

First Group

11 **Voice and Diction** (3) Bielski, Regn
Development of naturalness, correctness, and clarity in conversation throug the study of phonetics, rate, volume, pitch, and quality in preparation f performance. Recording fee, $5. Same as CmTr 11. (Fall, spring, an summer)

Second Group

101 **Bioacoustics** (3) Brew
Acoustic analysis of speech and the physiology of reception and processing speech by the human auditory system. Prerequisite: BiSc 3–4 or 11–12 equivalent; Psyc 1 or 5 or 6 or equivalent. (Spring)

102 **Neural Substrates of Speech, Hearing, and Language** (3) Linebaug
Neuroanatomy and neurophysiology as they relate to speech and hearin Emphasis on sensory and motor systems and neuroanatomical correlates language processing. (Spring)

103 **Biophonetics** (3) Linebaug
Anatomy and physiology of the auditory and speech production mechanism Emphasis on the functions of the respiratory, laryngeal, and orofacial stru tures in normal speech production. (Fall)

104 **Introduction to Speech–Language Pathology** (3) Regn
Survey of the field of speech–language pathology. The effect of body-syste pathologies and environmental factors on the production of speech an language. (Spring)

108 **Introduction to Audiology** (3) Brew
Survey of the field of audiology. The effect of body-system pathologies on t reception of speech and other acoustic stimuli. Procedures of pure-tone an speech audiometry. Clinical and educational services for the hearing im paired. Prerequisite: SpHr 101. (Spring)

118 **Structural Analysis of Speech and Language** (3) Sc
Development of skills in the phonetic/phonemic transcription and syntact analysis of oral language samples. Prerequisite: Psyc 115 or equivalent. (Spring)

119 **Clinical Procedures for Communication Disorders** (3) Hill
Precision treatment techniques for communication disorders. Emphasis o accountability of providers of clinical and educational services for th communicatively handicapped. Prerequisite: Psyc 121 and 131, or equiva lent, and permission of instructor. (Fall)

120 **Advanced Study of Clinical Procedures for Communicative Disorders** (1 to 3) Hill
Seminar on problems encountered in clinical practice for remediation

communicative disorders. Staffings of active case material from clinical and educational settings. Development of hardware and software programming skills for treatment of communicative disorders. Term project required for graduate students. Concurrent clinical or educational placement required. Prerequisite: SpHr 119 or equivalent. (Spring)

196 **Independent Study** (1 to 6) Staff
Independent research and special projects. Open only to undergraduate students in their senior year. Before students are permitted to register for SpHr 196, they must submit a written proposal of the plan of study and obtain approval of the staff member who will be directing the study and of the department chairman.

Third Group

267 **Industrial Audiology** (3) Bowling
Review of theories and processes pertinent to communication disorders related to industrial noise. Methods of assessing environments and pertinent legislation. (Fall)

268 **Clinical Practice in Communication Disorders** (1 to 3) Staff
Supervised clinical practice in the evaluation and treatment of communication disorders. May be repeated for a total of 3 semester hours of credit. (Fall, spring, and summer)

269 **Community Programs in Communication Disorders** (3) Herer
Methods and procedure for the planning, management, and operation of hospital, school, and other community programs for the communicatively handicapped. (Fall)

270 **Audiological Evaluation of Children** (3) Bowling
A study of the development of the sense of hearing; underlying causes of auditory deficits and audiometric techniques used to measure hearing in children. (Spring)

271 **Developmental Disorders of Speech Production** (2) Regnell
Evaluation of persons with speech articulation disorders; test demonstrations, oral peripheral examination; special segments on evaluation and treatment of velopharyngeal dysfunction (including cleft palate) and cerebral palsy. Laboratory fee, $7.50. (Summer)

272 **Disorders of Speech Articulation** (3) Hillis
Consideration of speech articulation disorders from physiologic, acoustic, perceptual, linguistic, and learning points of view. Review of treatment methods and programs. Laboratory fee, $7.50. (Spring)

273 **Language Disabilities in Children: Identification and Diagnosis** (2) Staff
Review of current theoretical approaches to evaluation; a diagnostic model to facilitate evaluation and interpretation; review of available standardized tests; observation and testing experience. Laboratory fee, $7.50. (Fall)

274 **Language Disabilities in Children: Remediation** (3) Staff
Review of current therapeutic models; use of diagnostic information for designing a remedial plan; monitoring progress; coordinating language remediation with classroom and additional resource support; experience through monitoring ongoing language remediation. Laboratory fee, $7.50. (Spring)

275 **Speech Fluency Disorders: Evaluation and Treatment** (3) Hillis
Procedures for clinical assessment of stuttering and other disorders of speech rate and rhythm. Review of historical and current methods for treatment. Laboratory fee, $7.50. (Fall)

276 **Speech Fluency Disorders: Theory and Research** (3) Hillis
Consideration of stuttering and other disorders of speech rate and rhythm from developmental, linguistic, physiological, and psychosocial points of view. Laboratory fee, $7.50. (Spring)

277 **Differential Diagnosis of Acquired Language Disorders** (2) Linebaugh
Review of neurological substrates of language processing and widely used

tests of acquired language disorders; consideration of patterns of communi-
tive deficits related to various neuropathologies, with emphasis on the
differentiating clinical features and prognosis. Laboratory fee, $7.50.
(Fall)

278 **Rehabilitation of Acquired Language Disorders** (3) Linebaug
Review of the nature of acquired language disorders and factors affecting
patient performance; consideration of specific treatment approaches and
methods for assessing recovery and efficacy of treatment. Laboratory fee,
$7.50. (Summer)

279 **Motor Speech Disorders: Differential Diagnosis and Treatment** (3) Linebaug
Methods of assessing motor speech disorders and their physical and acoustic
characteristics; approaches to the treatment of the dysarthrias and apraxia of
speech. Laboratory fee, $7.50. (Spring)

280 **Functional Voice Disorders** (3) Regan
Review of the normal structure and function of the vocal mechanism;
acquisition of knowledge and of clinical/educational skills in providing
speech evaluation and treatment for persons with functional voice disorders.
Programs for the remediation of these voice problems will be covered.
Laboratory fee, $7.50. (Fall)

281 **Organic Voice Disorders** (3) Regan
Acquisition of knowledge and clinical educational skills in providing speech
evaluation and treatment for persons with organic voice disorders; special
inclusion of management of laryngectomized persons. Laboratory fee, $7.5
(Summer)

283 **Aural Rehabilitation** (3) Brewer
Systems, principles, and methods of auditory training and speech reading,
including development of lesson plans and their application in resolving
communication problems of acoustically handicapped individuals. Labora-
tory fee, $7.50. (Fall)

284 **Advanced Clinical Audiology** (3) Brewer
Psychoacoustic principles and methods underlying assessment of auditory
disorders. Clinical implications, tests; demonstration and practicum. Labora-
tory fee, $7.50. (Fall)

285 **Hearing Aids** (3) Staff
Discussion of hearing-aid characteristics and electroacoustic measurements;
hearing-aid effectiveness in improving communicative efficiency; procedures
for selection and clinical evaluation of hearing aids; counseling of the patient.
Laboratory fee, $7.50. (Spring)

286 **Special Auditory Tests** (3) Bowling
Special audiometric techniques for cochlear and retrocochlear lesions, identi-
fying functional hearing losses; study of electrophysiological techniques.
Clinical application of tests and interpretation of results. Laboratory fee,
$7.50. (Spring)

287 **Auditory Processing** (3) Bowling
Detailed study of the factors that affect auditory perception and comprehen-
sion; methods and procedures used in identifying disorders of auditory
perception and comprehension. Laboratory fee, $7.50. (Fall) Staff

288 **Psychosocial Aspects of Hearing Loss** (3)
Consideration of the rationale and procedures for evaluating the social and
emotional behavior as well as the intellectual potential of those with
impaired hearing. Laboratory fee, $7.50. (Summer) Staff

289 **Immittance Audiometry and Middle Ear Function** (3)
Development of skills in immittance audiometry and audiological assessment
of middle ear function. Laboratory fee, $7.50. (Fall) Staff

290 **Management of the Hearing-Impaired Child** (3)
Overall management approach to the hard-of-hearing child, including diag-
nosis, parent counseling, amplification, educational placement, treatment

programs and procedures, and re-evaluation. Prerequisite: a course in basic principles and procedures in audiology. Laboratory fee, $7.50. (Summer)

292 **Seminar: Communicative Disorders in School Children** (arr.) Staff
Varying topics concerned with provision of remedial services for hearing-, language-, and speech-handicapped school children. May be repeated for credit. Admission by permission of instructor. Laboratory fee, $7.50. (Summer)

295 **Independent Research in Speech–Language and Hearing** (arr.) Staff

299-300 **Thesis Research** (3-3) Staff
(Fall and spring)

STATISTICS/COMPUTER AND INFORMATION SYSTEMS

Professors H.F. Bright *(Emeritus)*, S. Kullback *(Emeritus)*, H.W. Lilliefors, A.D. Kirsch *(Chairman)*, J.L. Gastwirth, S.W. Greenhouse, N.D. Singpurwalla, M. Halperin *(Research)*, R.T. Smythe, L.J. Wei, J.M. Lachin III, A.M. Mark *(Visiting)*
Professorial Lecturers B. Bailar, J. Kullback, K.M. Wolter, C.T. Ireland, F. Ponti, T. Jabine, W.J. Smith, S. Shrier
Associate Professors R.E. Thomas, P.F. Thall
Associate Professorial Lecturers P.P. Biemer, N.J. Kirkendall, R. Jacob, T.C. Teeples, J.S. Wu, M.C. Michaud
Assistant Professors H.M. Mahmoud, P.W. Wirtz, T.K. Nayak, M.A. Foulkes *(Research)*, S.E.F. Schlesselman *(Research)*
Assistant Professorial Lecturers A. Chu, E.E. Gbur, Jr., R.F. Raubertas

Bachelor of Arts or Bachelor of Science with a major in statistics (departmental), statistics with an option in computer science (departmental), or computer and information systems (departmental)—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the humanities and social sciences.)

2. Prerequisite courses for all majors—Math 31, 32, 33; Stat 91 (except computer and information systems majors).

3. Required courses for all majors—Math 124; Stat 129, 130.

4. (a) Required courses for the statistics major—Stat 118, 119, 157–58, 189, plus three approved second-group courses in statistics.

(b) Required courses for the statistics major with an option in computer science—Math 113; Stat 118, 119, 131, 157–58, plus three approved second-group computer related courses.

(c) Required courses for the computer and information systems major—Math 113; Stat 131, 133, 134, 135, 142, 157–58 or 189–90, plus two approved courses from Stat 145, 146, 147, 148, 149, 150

5. Students planning on doing graduate work in statistics are advised to take Stat 190, Math 139 and 140, and two years of a foreign language. Math 157 is also recommended.

6. To assure a balanced program, departmental approval of electives is required for all majors.

Students who seek Special Honors in statistics should check with the Department.

Minor in statistics—18 hours of approved courses in this department, including an introductory statistics course, Stat 118, and one computer course.

Minor in computer science—18 hours of approved courses in this department, including Stat 129, 130, 131, and one course in statistical methods. A year of calculus is recommended.

Master of Science in the field of applied statistics or *Master of Arts in the field of mathematical statistics*. The program of study consists of 30 to 36 semester hours of course work without a thesis. In exceptional cases the department may approve a program of study consisting of 24 to 30 semester hours of course work plus a thesis.

equivalent to 6 additional semester hours. Candidates must pass a written Master Comprehensive Examination and must fulfill the tool requirement by passing either reading knowledge examination in an acceptable foreign language or an examination computer language. For prerequisites and additional requirements, see below.

Master of Science in the field of applied statistics—Four options are provided: (a) general curriculum in applied statistics; (b) a concentration in biostatistics; (c) concentration in sampling and survey research; (d) a concentration in computer scienc Prerequisite: Math 31, 32, 33, and 124; Stat 118 and 157–58. (Stat 157–58 is not require if Stat 201–2 is included in the program.)

Required: the general requirements stated under the Graduate School of Arts an Sciences and 30 to 36 semester hours of course work. If the student has not previousl had Stat 119 or equivalent, the program must include Stat 221 or 217–18. Courses a selected in consultation with the advisor.

(a) *General curriculum in applied statistics*—The core curriculum includes Stat 201- and 210. An additional 21 semester hours must be chosen in consultation with th advisor.

(b) *Concentration in biostatistics*—The core curriculum includes Stat 187, 201–2, 21 225–26, 227, 231. Twelve additional semester hours are electives of which 6 hours mus be in statistics and 6 hours must be in health sciences or related areas. All electives mus be approved by the advisor.

(c) *Concentration in sampling and survey research*—The core curriculum include Stat 187, 193, 196, 210, 287–88. An additional 15 semester hours are electives of which a least 9 credit hours must be in statistics (Stat 201–2 is strongly recommended). A electives must be approved by the advisor.

(d) *Concentration in computer science*—The core curriculum includes Stat 201–2 an 210. An additional 21 hours must be selected, of which 12 hours will be from a approved list of computer science courses. Selections will be made in consultation wi the advisor.

Master of Arts in the field of mathematical statistics—Prerequisite: a bachelor's degre with a major in statistics from this University, or an equivalent degree. If undergradua study did not include equivalent required courses, those courses must be taken a prerequisite to graduate study. Additional prerequisites include Math 139 and 14 Under certain circumstances some prerequisites may be waived; check with the depar ment.

Required: the general requirements stated under the Graduate School of Arts an Sciences, including Stat 201-2 and 217-18. The remaining 18 semester hours must b selected in consultation with the advisor.

Doctor of Philosophy in the field of statistics—Prerequisite: A master's degree statistics or a related discipline. The main requirement is a strong background mathematics, including courses in advanced calculus, linear algebra, and mathematic statistics (similar to Stat 201–2). Some deficiencies may be made up concurrently dur the student's first year. In some instances, a student may enter the Ph.D. program with bachelor's degree.

Required: The general requirements stated under the Graduate School of Arts an Sciences, including satisfactory completion of (1) Stat 201–2, 217–18, 257, 258, 263, 264 and a minimum of 24 additional semester hours as determined by consultation with th departmental doctoral committee; (2) the tool requirement, which consists of passing reading knowledge examination in a foreign language and an examination in compute languages; (3) the General Examination, consisting of two parts: (a) a written qualifyin examination that must be taken within 24 months from the date of enrollment in th program and is based on the four-course core (Stat 257, 258, 263, 264) and (b) a examination to determine the student's readiness to carry out the proposed dissertation research; and (4) a dissertation demonstrating the candidate's ability to do original research in one of the following fields: Bayesian inference, biostatistics, design o experiments, multivariate analysis, nonparametric statistics, probability (theoretical applied), reliability theory, robust methods, sampling, statistical inference, stochastic processes, and time series.

Departmental prerequisite: One entrance unit in algebra is prerequisite to all first-group courses in statistics. Stat 131 is prerequisite to computer and information systems courses that follow it (i.e., Stat 133 to 150).

First Group

*51 **Introduction to Business and Economic Statistics** (3) Wei and Staff
Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, probability distributions, sampling, estimation, tests of hypotheses, regression and correlation, index numbers. (Fall and spring)

*53 **Introduction to Statistics in Social Science** (3) Staff
Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, sampling, estimation, tests of hypotheses, regression and correlation. (Fall and spring)

*91 **Principles of Statistical Methods** (3) Lilliefors
Probability, frequency distributions and their characteristics, descriptive measures, estimation, tests of hypotheses, regression and correlation. An introduction to the use of computers in statistical analysis. (Fall and spring)

Second Group

103 **Sampling in Accounting** (3) Bright
Special emphasis on applications of sampling techniques and design to accounting problems. Prerequisite: Stat 51, 53, 91, or equivalent. (Fall and spring)

*104 **Statistics in Management, Administration, and Policy Studies** (3) Staff
Lecture (3 hours), laboratory (1 hour). Introductory study of statistical techniques for research problems. For graduate students in fields other than statistics who have no previous statistics training.

105 **Statistics in the Behavioral Sciences** (3) Kirsch
Lecture (3 hours), laboratory (1 hour). Advanced study of statistical techniques for research problems. Analysis of variance, correlation techniques, nonparametric techniques, sampling theory. Prerequisite: Stat 53, 104, or equivalent, and satisfactory performance on a placement examination. (Fall and spring)

*111 **Business and Economic Statistics I** (3) Staff
Descriptive statistics, graphical methods, probability, special distributions, random variables, sampling, correlation, estimation and confidence intervals, hypothesis testing. (Fall)

112 **Business and Economics Statistics II** (3) Staff
Continuation of Stat 111, with emphasis on techniques of regression, chi-square, sampling designs, index numbers, and other topics used in economics and business. Prerequisite: Stat 111 or equivalent. (Spring)

118 **Regression Analysis** (3) Thall
Lecture (3 hours), laboratory (1 hour). Simple and multiple linear regression, partial correlation, residual analysis, stepwise model building, multicollinearity and diagnostic methods, indicator variables. Prerequisite: 3 semester hours selected from Stat 51, 53, 91, 104, 127. Laboratory fee. (Fall and spring)

119 **Analysis of Variance** (3) Staff
Lecture (3 hours), laboratory (1 hour). Introduction to the design of experiments and analysis of variance: randomized block, factorial, Latin square designs, and analysis of covariance. Prerequisite: Stat 118. Laboratory fee. (Spring)

121 **Contingency Table Techniques** (3) Staff
Analysis of multidimensional contingency tables, including estimation, tests

*Stat 51, 53, 91, 104, 111, and 127 are related in their subject matter, and credit for only one of these six may be applied toward a degree.

of hypotheses, and log-linear regression. Prerequisite: Stat 118 or permis
of instructor. Laboratory fee. (Spring)

123 **Introduction to Econometrics** (3)
Same as Econ 123.

*127 **Statistics for the Biological Sciences** (3)
Introduction to statistical techniques and reasoning applicable to the bio
ical and related sciences. Properties of basic probability functions: binom
Poisson, and normal. Data analysis, inference, and experimental design
(Fall and spring)

†129 **Introduction to Computing** (3)
Computer and programming concepts; algorithm development. High-
language programs written by students will be run on the University
puter. Laboratory fee. (Fall and spring)

130 **Computer Programming** (3)
Development of advanced computing ideas using a high-level lang
Emphasis on careful design and implementation of programs using "
tured programming." Prerequisite: Math 31 or concurrent registratio
permission of instructor and Stat 129 or equivalent. Laboratory fee.
and spring)

131 **Data Structures** (3)
Files and file systems. Linked lists and trees. Basic structure of proces
operations: creating, updating, sorting, merging, searching, linking, has
Introduction to data processing, storage, and retrieval. This course is pre
uisite to the following courses in computer and information systems (i.e.,
133 to 150). Prerequisite: Stat 130 or equivalent. Laboratory fee. (Fall
spring)

133 **Computer Organization and Assembly Language** (3)
Data representation and arithmetic; computer structure and machine
guage; computer architecture. Assembly language; addressing techniques
input and output. Study of an actual small computer. Prerequisite: Stat
Laboratory fee. (Fall)

134 **Operating Systems** (3)
Techniques for handling simultaneous processes; dynamic procedure act
tion; synchronization and mutual exclusion; semaphores. Operating sys
design methodologies; abstract data types; monitors; kernels. Memory m
agement; memory hierarchy; paging. Recovery procedures. Prerequisite:
133. Laboratory fee. (Spring)

135 **Survey of Programming Languages** (3)
Structured and nonstructured languages; list-structured languages; pat
matching and symbol manipulation languages; interpretive and interac
languages; variable binding. Prerequisite: Stat 131. Laboratory fee. (Spr

142 **Introduction to Automata Theory** (3)
Finite state automata. Turing machines and computability; universal Tu
machine; computable and noncomputable functions; halting problem; c
putational complexity. Formal grammars and their relationship to autom
Prerequisite: Stat 131 and a course in propositional calculus. Laboratory

145 **Compiler Design** (3)
Grammars, languages, syntax, and semantics. Lexical analysis; symbol tab
context-free language parsing techniques; code generation. Prerequisite:
142. Laboratory fee.

146 **Design and Development of Software** (3)
Design techniques; structured programming; code reading; stepwise refi
ment; top–down design; information hiding; coupling and cohesion. Dev
opment of a multicomponent software project by students. Prerequisite:
131. Laboratory fee. (Fall)

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* Stat 51, 53, 91, 104, 111, and 127 are related to their subject matter, and credit for only one
the six may be applied toward a degree.
† Credit will not be given for both Stat 129 and 197.

147 **Artificial Intelligence** (3) Staff
Representation of knowledge; notational systems such as logics, programming languages, trees, and networks; LISP. Search strategies; heuristics; production rule systems. Algorithms used in AI; natural language processing, vision, manipulator operation, theorem proving, problem solving. Prerequisite: Stat 131. Laboratory fee.

148 **Data Base Systems** (3) Staff
Sequential file processing; random access storage. Hierarchical, network, and relational data models. Data normalization; data description languages; query facilities. File and index organization; inverted files. Data integrity and reliability; computer security. Prerequisite: Stat 131. Laboratory fee.

149 **Simulation and Modeling** (3) Smith
Discrete simulation of real-world systems. Simulation techniques and languages; queues; event-driven simulation systems. Analysis of algorithms; predicting system performance; queuing theory. Prerequisite: Stat 131; some statistics. Laboratory fee.

150 **Current Topics** (3) Staff
Concepts of programming, programming languages, operating systems, nonnumeric programming compiler techniques. Prerequisite: Stat 131 or permission of instructor. Laboratory fee. May be repeated for credit. (Spring)

153–54 **Mathematical Models in Population Genetics** (3–3) Staff
Basic elements of genetics and cell reproduction, deterministic models of gene frequency; and Hardy-Weinberg law; effects of mutation, migration, and selection on gene frequency; multiple loci and multiple allele models; inbreeding; Fisher's fundamental theorem of natural selection; stochastic models of changes in gene frequency, including methods of direct product branching processes and diffusion equation methods.

157–58 **Introduction to Mathematical Statistics** (3–3) Staff
Distribution theory, sampling theory, estimation, hypothesis testing, regression analysis, experimental design. Prerequisite: differential and integral calculus. (Academic year)

160 **Mathematical Statistics for Economics Students** (3) Staff
Preparation for Stat 275. Prerequisite: Math 31 and 32 or equivalent. (Spring)

181 **Applied Time Series Analysis** (3) Kirkendall
Autoregressive integrated moving average (ARIMA) modeling and forecasting of univariate time series. Estimation of spectral density functions, white noise tests, and tests for periodicities. Theory and applications using SAS on the GWU computer. Prerequisite: Math 33, Stat 157–58 or 118.

183 **Intermediate Statistical Laboratory:** Wirtz
Statistical Computing Packages (3)
Application of program packages (e.g., SAS, SPSS, Biomed) to the solution of multivariate statistical problems. Basic concepts in data file preparation, manipulation, analytical techniques, and interpretation of results. Prerequisite: an introductory statistics course. Laboratory fee.

187 **Introduction to Sampling** (3) Staff
Problems of sampling and sample design. Prerequisite: Stat 91 or equivalent. (Fall)

188 **Nonparametric Statistical Inference** (3) Lilliefors
Statistical inference when the form of the underlying distribution is not fully specified. Nonparametric procedures for estimation and testing hypotheses. An introduction to robust procedures. Prerequisite: Stat 91 or equivalent. (Spring)

189–90 **Mathematical Probability and Applications** (3–3) Staff
Combinatorial analysis, conditional probability, stochastic independence, probability distributions, random variables, laws of large numbers. Prerequisite: differential and integral calculus. (Academic year)

193 **Questionnaire Design** (3) Staff
Principles and procedures for developing effective questionnaires for mail,

telephone, and personal interview surveys. Prerequisite: Stat 187 or equiva-
lent, or permission of instructor Sta

195 **Reading and Research in Statistics** (arr.)
May be repeated once for credit. (Fall and spring) Sta

196 **Seminar: Major Governmental Surveys** (3)
Analysis of problems in conducting and using governmental surveys. Topi-
include sample design, question wording, field collection procedures, a
basic tabulations. Surveys covered include the 1980 census, the Consum
Price Index series, and a representative survey in the areas of education a
health Thom

*197 **Digital Computer Programming With Applications** (3)
Lecture (2 hours), laboratory (2 hours). Use of digital computer in statistic
and other computational work. Writing, debugging, and running programs
the digital computer in the University Computer Center. Prerequisite: S
118, or Math 32; or permission of instructor. Laboratory fee. (Fall a
spring) Sta

198 **Special Topics** (3)
Topic to be announced in the *Schedule of Classes*. May be repeated for cre
provided the content differs. A laboratory fee may be charged, depending
the topic taught.

Third Group

201–2 **Mathematical Statistics** (3–3) Lillieto
Distribution theory, sampling theory, estimation, sufficient statistics, hypoth
esis testing, analysis of variance, multivariate normal distribution. (Ac
demic year)

203 **Fundamental Algorithms and Their Analysis** (3) Mahmo
Basic tools for the study of algorithms, including asymptotic analysis a
recurrence relations. Graphs and their representation in a computer. Sor
NP-complete graph problems. Open to qualified seniors. Prerequisite: Ma
124; Math 113 or Stat 198; Stat 131. Laboratory fee. (Spring) Shri

204 **Expert Systems** (3)
Advanced study of machine intelligence, with special emphasis on exper
systems. Topics include advanced systems for problem solving and automa
ed reasoning, reasoning with uncertainty, search control, learning a
learning machines. Theory and applications. Prerequisite: Stat 147. Labo
tory fee. (Spring) Kir

206 **Multivariate Methods in the Behavioral Sciences** (3)
Application of multivariate analysis to data of the social sciences. Techniq
covered include factor analysis, cluster analysis, discriminant analysis, a
other topics. Prerequisite: Stat 105 or 118, and prior permission of
instructor. Not open to graduate students in statistics. Laboratory fee.
Lach

210 **Data Analysis** (3)
The application of statistical methods of data analysis, using statist
packages on a computer as applied to the data sets from several setting
Methods to be chosen from analysis of contingency tables, the general lin
model, regression, discrimination and classification, nonparametric meth
Prerequisite: Stat 118 and 197, or tool proficiency in computer programmi
or Stat 183. Laboratory fee. S

215–16 **Applied Multivariate Analysis** (3–3)
Application of multivariate statistical techniques to multidimensional
search data from the behavioral, social, biological, medical, and physic
sciences. Prerequisite: Stat 117, 157–58, and Math 124. Laboratory
(Academic year) Th

217–18 **Advanced ANOVA and Experimental Design** (3-3)
Advanced theory and application of general linear parametric model

* Credit will not be given for both Stat 129 and 197.

experimental designs, estimation, and hypothesis testing. Prerequisite: Stat 157–58 or 201–2; Math 124. (Academic year)

221 **Design of Experiments for Behavioral Sciences** (3) Kirsch
Applications of advanced experimental design to research problems in behavioral sciences and education. Prerequisite: Stat 105 or 118 or equivalent and permission of instructor. Not open to graduate students in mathematical statistics. (Spring)

223 **Bayesian Inference** (3) Singpurwalla
Systematic development of Bayesian viewpoint, with applications to the classical problems of statistics. Prerequisite: Stat 201–2.

225–26 **Biostatistics** (3–3) Greenhouse
Probability models, inference, and study design as applied to biomedical investigations. Prerequisite: Stat 201–2. (Alternate academic years)

227 **Research Strategies: Biostatistical Basis and Analysis** (3) Lachin
The statistical basis of the design, implementation, and analysis of each of the basic methods of scientific research: the cross-sectional study, the cohort follow-up study, the case-control (retrospective) study, the randomized comparative study (including clinical trials), and other nonrandomized observational and epidemiologic studies. Prerequisite: Stat 105 or 118 or permission of instructor.

231 **Contingency Table Analysis** (3) Staff
A study of the theoretical bases underlying the analysis of categorial data. Prerequisite: Stat 201–2 or 257–58.

242 **Advanced Statistical Problems in Economic Analysis** (3) Gastwirth
Applications of advanced theory to economic data.

257 **Probability** (3) Staff
Probabilistic foundations of statistics, probability distributions, random variables, moments, characteristic functions, modes of convergence, limit theorems, probability bounds. Prerequisite: Stat 201–2, knowledge of calculus through functions of several variables and series. (Fall)

258 **Distribution Theory** (3) Gastwirth
Special distributions of statistics, small and large sample theory, order statistics, and spacings. Prerequisite: Stat 257. (Spring)

259–60 **Advanced Mathematical Probability** (3–3) Smythe
Measure theory, probability spaces, random variables, probability distributions, sequences and sums of random variables, conditioning, limit theorems, martingales. Prerequisite: advanced calculus and permission of instructor. (Alternate academic years)

261 **Sequential Design and Analysis** (3) Staff
Wald's theory of sequential designs, optional stopping, choice of sequential experiments. Prerequisite: Stat 201–2. (Spring, odd years)

262 **Nonparametric Inference** (3) Wei
Inference when the form of the underlying distribution is unspecified.

263 **Advanced Statistical Theory I** (3) Nayak
(*Formerly Inference*)
Linear models, decision theoretic estimation, classical point estimation. Prerequisite: Stat 201–2. (Fall)

264 **Advanced Statistical Theory II** (3) Nayak
Asymptotic theory, hypothesis testing, confidence regions. Prerequisite: Stat 201–2, 257. (Spring)

265 **Multivariate Analysis** (3) Greenhouse
Multivariate normal distribution. Hotelling's T^2 and generalized T_0^2. Wishart distribution, discrimination and classification. Prerequisite: Stat 201–2 and Math 124. (Fall)

266 **Topics in Multivariate Analysis** (3) Greenhouse
Multivariate analysis of variance, principal components, canonical correlation, factor analysis. Prerequisite: Stat 265.

273–74 **Stochastic Processes** (3–3) Smyth
Fundamental notions of Markov chains and processes, generating function recurrence, limit theorems, random walks, Poisson processes, birth and dea processes, applications. Prerequisite: Stat 189–90, and 201–2 or 257–8 (Alternate academic years)

275 **Econometrics I: Introduction** (3) Sta
Joint offering of the Departments of Statistics and Economics. Single-equati models of economic behavior. Statistical methods for testing econom hypotheses and estimating parameters. Introduction to simultaneous equ tions problems. Prerequisite: Stat 157–58 or equivalent, or permission instructor. Recommended: a course in matrix theory. (Fall)

276 **Econometrics II: Simultaneous Equations Models** (3) Sta
Joint offering of the Departments of Statistics and Economics. Econom models and simultaneous equations systems. Prerequisite: Stat 275. (Sprin

279 **Methods in Economic Statistics** (3) Gastwir
Joint offering of the Economics and Statistics Departments. Application statistical methods to economic data. Univariate and multiple regression a nonparametric techniques are used to analyze economic data. Measures inequality, economic concentration, and forecast accuracy are discuss Prerequisite: a one-year course in statistics. (Fall)

281 **Advanced Time Series Analysis** (3) Kirkend
Autoregressive integrated moving average (ARIMA) modeling and forecasti of univariate and multivariate time series. Statespace or Kalman filter mode spectral analysis of multiple time series. Theory and applications using th University computer. Prerequisite: Math 33, Stat 201–2 or equivalent. Labor tory fee. (Spring) Sta

282 **Time Series Analysis II: Statistical Inference** (3) Sta
Multivariate normal processes, spectral estimation, tests of hypothes regression, discrimination filtering, spectral analysis of variance. Prereq site: Stat 261.

283 **Advanced Statistical Computer Concepts** (3) Wri
Use of high-level statistical computer programs (such as LISREL, CLUSTA KYST, INDSCAL, AID, CHAID) and statistical computer packages for a vanced data analysis. Extension of concepts introduced in Stat 183 complex file structures (such as hierarchical files) and advanced designs su as multiwave panel designs and multiple cross-sectional surveys. Advanc file manipulation techniques, job control language, and archiving of lar data files. Prerequisite: Stat 183 and either Stat 105 or 118. Laborato fee. (Fall) Sta

285–86 **Seminar: Special Topics in Sample Survey** (3–3) Sta
Admission by permission of instructor.

287–88 **Modern Theory of Sample Surveys** (3–3) Sta
Application of statistical theory to the sampling of finite populations. Simp stratified, cluster, double and subsampling. Special topics, including sup populations and randomized response. Prerequisite: Stat 91 and Math 32 equivalent. (Academic year)

289 **Seminar** (3) Sta
Admission by permission of instructor. (Fall and spring)

290 **Principles of Demography** (3) Sta
Same as Econ 290.

291 **Methods of Demographic Analysis** (3) Sta
Same as Econ 291.

295 **Reading and Research** (3) Sta
May be repeated once for credit. (Fall or spring)

297 **Problems in Mathematical Statistics** (3) Sta

298 **Seminar: Special Topics** (3) Sta

299–300 **Thesis Research** (3–3) Sta
(Fall and spring)

Fourth Group

378 **Seminar: Topics in Econometrics** (3) **Staff**
Same as Econ 378.

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

TELECOMMUNICATIONS POLICY—GRADUATE PROGRAM

Academic Director C.H. Sterling

The Graduate School of Arts and Sciences offers a multidisciplinary program leading to the degree of Master of Arts in the field of public policy with a concentration in telecommunications policy. The program focuses on the interaction among politics, economics, and technology.

Master of Arts in the field of public policy with a concentration in telecommunications policy—Prerequisite: a bachelor's degree with a *B* average from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 36 semester hours of course work. The required core courses are Econ 217; PSc 203; and Psyc 244. Required courses for the field of study are Econ 249; EE 450 (*Telecommunication Systems Concepts*), 451 (*Survey of Telecommunication Systems*); PSc 222, 224; TCom 240, 241; and one elective course selected in consultation with the academic director. Each student must pass a Master's Comprehensive Examination.

235 **Survey of Telecommunications Policy** (3)
Designed for those lacking background and seeking an introductory survey of a fast-changing field, this course provides discussion of domestic and international policy issues by experts from government and industry. The course may not be taken for credit by those enrolled as degree candidates in public policy with a concentration in telecommunications policy.

240 **Seminar in Telecommunications Policy** (3)
A systems approach provides advanced analytic techniques for assessing institutions and policy in domestic U.S. telecommunications, including local and long distance carriers and their regulation, spectrum utilization, mobile satellite and terrestrial services, electronic media issues, government telecommunication systems, the interface with international policies, and the general policy shift to deregulation. Prerequisite: Econ 217, PSc 222.

241 **Seminar in International Telecommunications Policy** (3)
A systems approach provides advanced analytic techniques for assessing the role and process of international telecommunications organizations, U.S. policy-making for the international sphere, system authorization and utilization issues, transborder data flow and the New World Information Order, barriers to trade in information equipment and services, the regional facilities planning process, and development of competition in international telecommunications. Prerequisite: Econ 217, PSc 222.

TRAVEL AND TOURISM

Professors D.E. Hawkins, J.D. Hunt (*Academic Director*)
Associate Professorial Lecturer D.L. Edgell
Assistant Professorial Lecturers J.D. Hardy, G.H. Moeller
Lecturers B.M. Dwyer, S.D. Cook, M.B. Creedon, T.G. Lloyd, S.A. Schulman, W.D. Wynegar

The School of Education and Human Development offers programs in travel a tourism leading to a Bachelor of Science in Human Kinetics and Leisure Studies and Master of Arts in Education and Human Development. Both are administered by t Department of Education. See the School of Education and Human Development programs of study.

First Group

100 **Experimental Course** (3) Su
Topics announced in the *Schedule of Classes*.

Second Group

104 **Introduction to Travel and Tourism** (3) Hawkins, Ha
Survey of the travel and tourism industry with emphasis on market tourism and travel, research and development of tourist destinations, and economic and social impact of tourism. (Fall)

113–14 **Practicum** (3–3) Su
Pre-student teaching or practical experience in related disciplines. (A demic year and summer)

133 **Student Teaching** (6–12) Su
Prerequisite: T&T 113–14 or equivalent. Admission by permission of instru tor. (Fall and spring)

143 **Tourist Accommodations and the Hospitality Industry** (3) Creed
An overview of the basic principles involved in the management, operation marketing, and financing of hotels, restaurants, and other tourist accommod tions, facilities, and services. (Spring)

144 **Tourist Attractions and Activities** (3) Ha
Basic principles of planning, developing, and managing natural and ma made attractions. National, state, and local park systems, as well as priva sector resorts, theme parks, and other tourist attractions are examine Various recreation activities popular among tourists are examined in view their personal, economic, social, and environmental impacts. (Spring

145 **Travel and Tourism Advertising, Public Relations, and Sales Techniques** (3) Hawkin
Reviews and applies basic advertising, public relations, and sales techniq to the travel and tourism field. Includes study of effective techniques a selected case studies and current practices. (Spring)

146 **Tourist Characteristics and Behavior** (3) Ha
Socioeconomic, demographic, and psychological characteristics of vario types of tourist populations. Emphasis on tourist behavior in planni developing, and marketing tourism programs and services. Cultural dif ences as they influence travel. (Fall)

147 **Travel and Tourism Transportation Systems** (3) Su
Overview of the various transportation modes. Planning, financial, operati al, marketing, and evaluation aspects of the different systems of transpor tion. Limited emphasis will be placed on the development of an adequ infrastructure to support specific transportation modes. (Fall)

172 **International Experiences** (1–6) Su
Travel to a foreign country for study of a specific topic. (Fall, spring, a summer)

173 **Independent Study** (1–6) Su
Individually designed model for intensive study in an area of special interes Prerequisite: demonstrated competency for independent work and permis sion of advisor and instructor. May be repeated for credit. (Fall, spring and summer)

178 **Designing and Implementing Conferences and Meetings** (3) Nadi
Same as Educ 178.

184 **Workshop** (1, 3, or 6) Staff
Topics announced in the *Schedule of Classes*. May be repeated for credit with permission of advisor. (Fall, spring, and summer)

190 **Sales Management for Travel Agents** (3) Staff
An in-depth study of agency products and services, with methodologies for maximum control and efficiency. (Fall)

191 **Business Management for Travel Agents** (3) Staff
Basic principles of business administration applied to small businesses in general and to travel agencies in particular. General management concepts (planning, organizing, leading, and controlling), with specific applications in management areas, including personnel, finance, office operations, law, and insurance. (Spring)

192 **Marketing Management for Travel Agents** (3) Staff
Marketing theories as applied to the travel agency. Coverage of the marketing mix in travel, market segmentation, market planning, and the use of advertising and other communications techniques. Emphasis on increasing profitability through planned marketing programs. (Fall)

193 **Domestic and International Tourism** (3) Staff
An overview of tourism theory, with emphasis on how such knowledge can help the travel agent understand and improve his or her function. Emphasis on the psychosocial aspects of tourism on the traveller and host community. Economic and social impacts are discussed. (Spring)

200 **Experimental Course** (3) Staff
Topics announced in the *Schedule of Classes*. (Fall, spring, and summer)

Third Group

249 **Economic, Sociocultural, and Ecological Aspects of Tourism** (3) Hawkins
Impact of tourism on economic development and social values; specific emphasis on psychosocial, physical, and community impacts. May be taken for undergraduate credit with permission of the instructor. (Fall and summer)

250 **Administration of Travel and Tourism Services** (3) Schulman
Organization and management concepts, theories, and issues, stressing application of theory through analysis of short case examples drawn from the broader range of the travel and tourism industry. (Spring and summer)

260 **Tourism Development** (3) Dwyer
Relationship of economic theory and principles to tourism development; applications of economic analysis techniques to the travel and tourism field. (Fall and spring)

261 **Planning for Tourism** (3) Hunt
Integrated planning for travel and tourism organizations; financial and physical development for comprehensive tourism projects; consideration of basic concepts, approaches, and models. (Fall and summer)

262 **Tourism Policy Analysis** (3) Edgell
Understanding components of tourism policy, development of tools for tourism policy analysis, and description of tourism organizations in the government and private sector. (Spring)

263 **Tourism Marketing** (3) Wynegar
Concepts and techniques employed in marketing travel industry products and services, including its public- and private-sector components. Assessment of the tourism product, development of the marketing strategy, preparation of the marketing plan, and analysis of specific promotional programs. (Spring and summer)

270 **Travel and Tourism Research** (3) Cook
Analysis of general research methods and tools and their application to the study of travel and tourism. Prerequisite: Educ 295. (Spring and summer)

280 **Advanced Workshop** (1–3) Staff
Workshops with emphasis on contemporary issues and problems; development of advanced professional competencies. May be repeated for credit with permission of advisor. (Fall, spring, and summer)

282 **International Experiences** (1 to 12) Staff
Travel to a foreign country for study of a specific topic. May be repeated for credit with approval of advisor. (Fall, spring, and summer)

283 **Practicum** (3 to 6) Staff
Field work, internship, and/or instructional practice, including conference and/or seminar. May be repeated once for credit with permission of advisor. (Fall, spring, and summer)

290 **Advanced Seminar** (1 to 3) Staff
May be repeated for credit with approval of advisor. (Fall, spring, and summer)

293 **Independent Study** (1 to 6) Staff
May be repeated for credit with approval of advisor. (Fall, spring, and summer)

296 **Systems Analysis of Tourism Services** (3) Moeller
Quantitative analysis, resource identification, design techniques, and other systems approaches applied to travel and tourism services. (Fall and spring)

297 **Advanced Topical Studies** (3) Staff
Independent research and study pertinent to the needs of the student. Prerequisite: Educ 295 and T&T 270 or permission of instructor. (Fall, spring, and summer)

299 **Thesis Research** (3 to 6) Staff
Individual research under guidance of a staff member. May be repeated for credit with approval of advisor. Prerequisite: Educ 295 and T&T 270 or permission of instructor. (Fall, spring, and summer)

UNIVERSITY COURSES

University Professors M. Cunliffe, A. Etzioni, P.J. Caws, S.H. Nasr

University courses are offered by distinguished scholars and scientists who hold appointments as University Professors. With the approval of the department or program, appropriate University courses may be taken to satisfy degree program requirements. Permission of the University Professor is required. Specific courses are listed in the *Schedule of Classes* in the 700 series.

URBAN AND REGIONAL PLANNING

Professors D.C. McGrath, Jr., S.S. Fuller *(Chairman)*, S. Greene
Adjunct Professor F. Gutheim
Associate Professors D.E. Gale, R.W. Longstreth
Assistant Professor M.J. Enders
Assistant Professorial Lecturer J.L. Preston
Visiting Lecturer O.T. Carr, Jr.

See the School of Government and Business Administration for the program of study leading to the degree of Master of Urban and Regional Planning, which provides preparation for professional practice in the planning field, and areas of specialization in planning as components of programs leading to the degrees of Master of Public Administration, Doctor of Business Administration, and Doctor of Public Administration.

First Group

50 **Washington, D.C.: History, Culture, and Politics** (3) Gillette and Interdisciplinary Team
Same as AmCv/Hist/PSc 50.

Second Group

153 **Fundamentals of Urban Planning and Design** (3) Greene
Studio course for undergraduates. Basic elements of urban planning and design applied to community problems. Survey of planner's role in developing and implementing creative solutions to urban problems. (Spring)

154 **Survey of American Urban and Regional Planning** (3) Staff
Examination of the historical roots, recent trends, issues, and new directions of American planning concepts, as well as the social and political forces that shape the character of planning in the United States. The roles of institutions, politicians, planners, and the general public in the planning process. Particular emphasis is placed on urban planning at the local governmental level. (Fall)

175–76 **American Architecture** (3–3) Longstreth
Joint offering of the Urban and Regional Planning Department and the American Studies Program. Examination of selected topics in American architecture from the 17th century to the present. Stylistic properties, form type characteristics, technological developments, and urbanistic patterns are introduced as a means of interpretation of historic meaning. Buildings are analyzed both as artifacts and as signifiers of social, cultural, and economic tendencies. U&RP/AmCv 175: 1600–1860; U&RP/AmCv 176: 1860–present. Same as Art 176 and 191. (Academic year)

177 **Introduction to Historic Preservation** (3) Gale
Washington, D.C., is the primary setting for the study of historic preservation as it has developed over the past century. Experience with preservation issues as shown by examples in other locations will also be discussed. Lectures, class discussions of the readings, and field trips to neighborhoods and sites subject to preservation efforts. Same as AmCv 177. (Spring and summer)

Third Group

201 **Planning Theory and Practice I** (3) Gale
Introduction to the development of urbanization and urban settlements in the United States, the emergence and growth of urban and regional planning, and the evolution of issues in the practice of the planning profession. (Fall)

202 **Planning Theory and Practice II** (3) Gale
Introduction to the concepts of planning, plan making, and plan implementation. Examination of the relationship between theory and practice in planning. Discussion of the role of reconnaissance studies, goal formulation, technological forecasting, and scenario development in planning practice. Prerequisite: U&RP 201 or permission of instructor. (Spring)

203 **Principles of Community Planning and Design** (4) Greene
Planning and design studio to develop and apply planning methods and graphic techniques, principles of land use and community design; analysis of factors affecting community development and change. Open only to candidates for the degree of Master of Urban and Regional Planning. Laboratory fee, $20. Prerequisite: U&RP 201 or permission of instructor. (Fall)

207 **Land Development Planning** (3) McGrath
Selected problems in urban and regional planning: applications of zoning, environmental controls, tax incentives, and other techniques available for the implementation of development plans. Prerequisite: U&RP 201 or permission of instructor. (Spring)

208 **Land Use and Urban Transportation Planning** (3) Staff
Relationships between land use and the movement of goods and people. Examination of land use and transportation planning principles, issues, and techniques. Roles of public and private interests in land use and transportation planning and management. Prerequisite: U&RP 201 or permission of instructor. (Spring)

210 **Urban Development Economics** (3) Ful
Economic forces affecting urban growth and change; relationships amo cities, metropolitan areas, and regions in the context of the national econo socioeconomic implications of urban land development policies; basic st ies and methods of economic analysis. Prerequisite: Econ 217–18 or equi lent or permission of instructor. (Fall)

211 **Methods of Urban and Regional Analysis I** (3) Pres
Study of basic statistical procedures and their interpretations, introduction the BASIC language and computer programming procedures, microcompu operations and statistical problem solutions. This course establishes a co puter capability that the student utilizes subsequently in all course assig ments. (Fall)

212 **Methods of Urban and Regional Analysis II** (3) Fuller, Pres
Introduction to methods used to analyze, estimate, and forecast populati employment, income, and economic growth and development. Includes ti series, index numbers, survey sampling and questionnaire design, shift-sha and case study methods. Prerequisite: U&RP 211. (Spring)

215 **Advanced Planning Problems** (4) McGr
Investigation of complex problems of the metropolitan region, analysis findings, formulation of proposals, and presentation of material to faculty a cooperating groups. Multidisciplinary team and individual planning proje Studio course. Laboratory fee, $20. Prerequisite: U&RP 203 or permissio instructor. (Fall)

218 **Metropolitan and Regional Planning** (3) Ful
Multidisciplinary study of the methods of regional analysis and process regional planning; development of projects of regional scale requiring pro lem analysis, synthesis, and plan formulation. Studio course. Laboratory fe $20. Prerequisite: U&RP 203 and 212 or permission of instructor. (Sprin

241 **Federal and State Urban Policy Development** (3) McGr
Investigation of contemporary trends in the evolution of federal and sta governmental functions and programs affecting urban growth and develo ment policy. Planning functions in evolving relationships among units federal, state, and metropolitan agencies. Prerequisite: U&RP 201 or perm sion of instructor. (Spring)

242 **International Urban Planning** (3) McGr
Examination and comparison of the theories of and approaches to urb planning in various countries. Analysis of the types of planning and develo ment techniques employed and their effectiveness. Applicability of su approaches and methods within the context of the American urban planni process. Prerequisite: U&RP 201 or permission of instructor. (Fall)

251 **Housing and Community Development: Concepts and Methods** (3) Fuller
An examination of the basic theories, concepts, principles, and analytic methods for managing the planning process by which cities approach th resolution of their development and housing needs. Housing supply an demand conditions, market analysis, physical inventory methods, commu ity facility planning and impact analysis, commercial revitalization, an neighborhood theory and dynamics. Prerequisite: U&RP 201 or permission instructor. (Fall)

252 **Housing and Community Development: Case Studies and Applications** (3) Ga
The application of theory and methodology to contemporary housing an community development issues. Examination of federal policies and pro grams, community facilities, redevelopment and adaptive reuse projects, an the role of the private sector. Case studies and field trips. Prerequisite: U&RP 251 or permission of instructor. (Spring)

255 **Urban Housing** (3) Fuller
A seminar that explores the principal issues affecting the demand for and supply of housing, including home financing, housing costs, tenure options

rehabilitation and conservation, market dynamics and requirements, and public-sector involvement. Prerequisite: U&RP 251 or permission of instructor. (Summer)

256 **Neighborhood Dynamics** (3) Gale
Residential location decisions as they affect land use in metropolitan areas. Middle class, elderly, and minority mobility patterns. Effects of discrimination, dislocation, condominiums, and historic preservation. Prerequisite: U&RP 201 or permission of instructor. (Summer)

257 **Fiscal Policy and Urban Planning** (3) Gale
Consideration of municipal fiscal conditions and their implications for urban planning. Examination of capital projects financing, tax policy and land use, and fiscal impact analysis of urban development. Prerequisite: U&RP 201 or permission of instructor. (Fall)

258 **Advanced Urban Development Economics** (3) Carr
Analysis of case studies of large-scale development projects to gain comprehension of financial, political, legal, and technical complexities and constraints inherent in the urban development process. Prerequisite: U&RP 210 or permission of instructor. (Spring)

261 **Community Planning and Design: Concepts and Methods** (3) Greene
Investigation of perceptual, social, physical, and aesthetic factors in planning and design. Emphasis on interaction of users and the environment, principles and process of community design, visual analysis, evaluation and implementation techniques. Prerequisite: U&RP 203 or permission of instructor. (Fall)

262 **Community Planning and Design: Case Studies and Applications** (3) Greene
Planning and design studio; application of community design principles and process to typical problems of community change and development. Laboratory fee, $20. Prerequisite: U&RP 261 or permission of instructor. (Spring)

263 **Community Preservation and Design Studio** (3) Greene
Interdisciplinary studio class: application of the techniques and methods of historic preservation, urban planning, housing and community development, community design, and other disciplines to problems of revitalizing urban areas. Surveys, inventories, analyses, formulation of proposals, and presentation to faculty and cooperating groups. Laboratory fee, $20. Prerequisite: U&RP 201 or permission of instructor. (Summer)

274 **International Historic Preservation** (3) Gutheim
Joint offering of the American Studies Program and the Urban and Regional Planning Department. Comparative examination and analysis of international organizations and activities dedicated to the preservation of historical places and cultural traditions. Review of national and multinational policies affecting preservation interests. (Spring)

277–78 **Historic Preservation: Principles and Methods** (3–3) Longstreth
Joint offering of the Urban and Regional Planning Department and the American Studies Program. Same as Hist 277–78. Exploration of scope and purpose of the preservation movement in the United States with focus on developments from the 1960s to the present. Topics include the emergence of preservation theories in the 19th century, relationships between attitudes toward the past and toward design, the intent and impact of legislation, organizational dynamics, approaches to documentation, the concept of significance, and preservation as an instrument of change. Discussions with representatives of organizations and public agencies supplement class lectures. (Academic year)

290 **Special Topics in Urban and Regional Planning** (3) Staff
Experimental offering: new course topics and teaching methods. May be repeated once for credit. (Fall or spring)

295 **Research Methods** (3)
Directed research and investigation of special problems in commun development. May be repeated once for credit. (Fall and spring)
298 **Directed Readings and Research in Urban and Regional Planning** (3)
299–300 **Thesis Research** (3–3)
(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students and are offered as the dema requires. They are open to other graduate students at the discretion of the departme

311–12 **Seminar: Public–Private Sector Institutions and Relationships** (3–3)
An analysis and critique of alternative theoretical frameworks for describi understanding, and predicting the nature, values, and actions of Americ public and private institutions. Problems, potentials, and alternatives structuring public and private institutional arrangements to meet the need society.
398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Business Administration Doctor of Public Administration general examination. May be repeated credit. (Fall and spring)
399 **Dissertation Research** (arr.)
Limited to Doctor of Business Administration or Doctor of Public Admini tion candidates. May be repeated for credit. (Fall and spring)

WOMEN'S STUDIES—GRADUATE PROGRAMS

Assistant Professor P.M. Palmer *(Director)*
Assistant Professorial Lecturers M.B. Pratt, R. Spalter-Roth

Committee on Women's Studies
M.M. Cassidy, S.E. Haber, K.E. Klenke-Hamel, P.H.M. Lengermann, P.M. Palmer, Romines, S.J. Tolchin

The Graduate School of Arts and Sciences offers two interdisciplinary progra leading to the degrees of Master of Arts in the field of women's studies and Master of A in the field of public policy with a concentration in women's studies. Both are direct by the Committee on Women's Studies and draw upon faculty from various departme within the University and resource persons in the community.

The women's studies programs seek to examine and integrate the contributions established academic disciplines to an understanding of the historical and contempor role and status of women, and to provide training necessary to evaluate and formul equitable public policy for women. Each student will work closely with an advisor designing a program to meet individual research interests and professional go Prospective degree candidates should consult with the director of the Women's Stud Program.

Master of Arts in the field of women's studies and *Master of Arts in the field of pub policy with a concentration in women's studies*—Prerequisite: a bachelor's degree fr an accredited college or university. Students are expected to have completed prerequisites to graduate courses.

Required: the general requirements stated under the Graduate School of Arts Sciences, and 36 semester hours of course work, with or without a thesis. All stude must take a common core of women's studies courses: WStu 220, 221, 225, and a final hours of either WStu 283 and 295 or WStu 299–300. Policy-oriented students must t four of the six courses in the public policy core (Stat 104 or 183; PSc 203; Psyc 244; Ec 211, 217, 247), with Stat 104 or 183, PSc 203, Psyc 244, and Econ 217 recommende WStu 240 may be substituted for the core policy analysis course (PSc 203). O

remaining three courses, two must be in the same discipline, which may be in the humanities, social sciences, or public administration. Those pursuing the Master of Arts in the field of women's studies must take, in addition to the core courses in women's studies, 12 semester hours in one other discipline and 9 hours of electives. All candidates are required to pass a Master's Comprehensive Examination. There is no tool requirement.

220 **Perspectives on Women** (3) Palmer
Survey of the historical development of feminist theory in Europe and the United States from the 1790s to the 1930s, focusing especially on feminist responses to and critiques of basic assumptions of the developing social science disciplines. Topical focus on the application of theories to the explanation of family, work, and political roles of women. (Fall)

221 **Research Issues in Women's Studies** (3) Spalter-Roth
Analysis of the contribution of feminist or gender-relations perspectives to the issues and methods of social research and social policy and practice, especially in the areas of economic policy, the workplace, families, child care, and transfer payments. Topics include a review of feminist frameworks, a critique and re-evaluation of traditional academic disciplines, analysis of current research on and for women, analysis of current social policy in women's interest, and modes of influencing the policy process. (Fall)

225 **Feminist Theory** (3) Staff
Theoretical foundations of feminism in the U.S. Theories and proposals for change currently espoused. Although focus is primarily on feminism of contemporary white America, some Third World and European thought will be considered. (Spring)

240 **Women and Public Policy** (3) Staff
Systematic analysis of public policy formation at the federal, state, and local levels as it relates to the status of women. Strategies for change and impact of the women's movement. Team and individual research projects on executive decision making, legislation and its implementation, and political party structures. (Spring)

241 **Women and the Law** (3) Staff
Legal status of women. Emphasis on marital status, employment, media, education, health services, crime, and the Constitution. (Fall and spring)

251 **Women, Literature, and the Arts** (3) Pratt
Woman as subject and object. Examination of stereotypes, themes, language, patterns, and symbolism in works by and about women. Particular attention to the woman as artist and the development of feminist criticism. (Fall)

260 **Women in the American Work Force** (3) Palmer
Joint offering of the American Studies Program and the Women's Studies Program. Multidisciplinary analysis of women's role in the labor force and historical changes in that role. Societal view of women's work in the home and outside it; interrelationships of women in and out of the work force; women's contributions, traditionally and during national crises; class, race, and ethnic differences. (Spring)

270 **Seminar: Selected Topics** (3) Staff
Investigation of a current policy issue of particular concern to women, or consideration of women's status in a particular social system. (Fall and spring)

280 **Independent Study** (3) Staff
May be repeated for credit. Arrangements must be made with sponsoring faculty member prior to registration.

283–84 **Practicum in Women's Studies** (3) Palmer and Staff
Study of the changing status of women through supervised assignment to public and private agencies engaged in policy-making, education, counseling, political action, and research. Placement arrangements should begin the semester prior to registration for this course.

295 **Independent Research in Women's Studies** (arr.) Staff
Individual library or field research. Program advisor's approval of a written proposal required.

299–300 **Thesis Research** (3–3) Staff

The courses listed below, which emphasize the experience of women in the past and present, are available in Columbian College for undergraduate and graduate students:

AmCv/Hist 185	*History of Women in America* (3)	DePauw
Clas 170	*Women in Classical Antiquity* (3)	Staff
Econ 141	*Women in the Labor Market* (3)	Haber
Hist 125	*Women in European History* (3)	Schwoerer
Psyc 150	*Psychology of Sex Differences* (3)	Popper
Rel 181	*Women in Western Religion* (3)	Quitslund
Soc 155	*Gender Roles and Socialization* (3)	Wallace

YIDDISH

See **Classics.**

ZOOLOGY

See **Biological Sciences.**

FACULTY AND STAFF OF INSTRUCTION 1984–1985

Columbian College of Arts and Sciences

Graduate School of Arts and Sciences

School of Education and Human Development

School of Government and Business Administration

School of Public and International Affairs

EMERITI

Caroline Lander Adams, *Professor Emeritus of Botany*
B.A. 1925, Illinois College; M.S. 1928, University of Chicago; Ph.D. 1932, University of Wisconsin

Grover LaMarr Angel, *Professor Emeritus of Education*
B.A. 1929, High Point College; M.A. in Ed. 1946, Ed.D. 1952, George Washington University

Ruth Harriet Atwell, *Professor Emeritus of Physical Education for Women*
Ph.B. 1918, Denison University; M.A. in Ed. 1933, George Washington University

Robert Edward Baker, *Professor Emeritus of Education*
B.S. in Ed. 1939, State University of New York at Buffalo; M.A. 1954, Catholic University of America; M.A. in Ed. 1956, Ed.D. 1962, George Washington University

Richard Adrian Barrett, *Professor Emeritus of Business Administration*
B.A. 1930, Amherst College; M.B.A. 1932, Harvard University; D.B.A. 1972, George Washington University

Gretchen Rogers Bolwell, *Professor Emeritus of German*
B.A. 1930, M.A. 1931, George Washington University; Ph.D. 1938, Johns Hopkins University

Perry Botwin, *Professor Emeritus of Special Education*
B.S. 1942, Rutgers—The State University; M.A. 1947, New York University; Ed.D. 1957, Columbia University

Marcella Brenner, *Professor Emeritus of Education*
B.S. in Ed. 1934, Johns Hopkins University; M.A. 1949, American University; Ed.D. 1962, George Washington University

Harold Frederick Bright, *Professor Emeritus of Statistics; Vice President for Academic Affairs Emeritus*
B.A. 1937, Lake Forest College; M.S. 1944, University of Rochester; Ph.D. 1952, University of Texas

Arthur Edward Burns, *Professor Emeritus of Economics*
B.A. 1931, M.A. 1934, University of California, Berkeley; Ph.D. 1935, George Washington University

Elizabeth Burtner, *Professor Emeritus of Physical Education*
B.A. 1927, Hood College; M.A. 1935, Columbia University

Paul Calabrisi, *Professor Emeritus of Anatomy*
B.A. 1931, Catholic University of America; M.A. 1940, George Washington University; Ph.D. 1955, Cambridge University, England

Wesley Thomas Carroll, *Professor Emeritus of Education*
B.S. 1933, Iowa State University of Science and Technology; M.A. 1940, Ph.D. 1952, University of Nebraska

James Harold Coberly, *Professor Emeritus of English*
B.A. 1933, M.A. 1938, Ph.D. 1949, George Washington University

Charles William Cole, *Professor Emeritus of English*
B.A. 1930, M.A. 1931, Ph.D. 1939, George Washington University

Mary Ellen Coleman, *Professor Emeritus of Education*
B.S. 1937, Madison College; M.A. in Ed. 1950, George Washington University

Milton Crane, *Professor Emeritus of English*
B.A. 1937, M.A. 1938, Columbia University; M.A. 1941, Ph.D. 1942, Harvard University

Milton Charles Devolites, *Professor Emeritus of Health Services Administration*
B.A. 1938, Harvard University; M.A. 1953, Baylor University

William Rankin Duryee, *Research Professor Emeritus of Pathology (Experimental)*
B.A. 1927, Ph.D. 1933, Yale University

Frederick Harrell Gibbs, *Professor Emeritus of Health Care Administration*
B.S. 1958, University of Maryland; M.H.A. 1959, University of Minnesota

Ira Bowers Hansen, *Professor Emeritus of Zoology*
B.S. 1928, M.A. 1929, Wesleyan University; Ph.D. 1932, University of Chicago

Clarence Richard Hartman, *Associate Professor Emeritus of Microbiology*
B.A. 1933, M.D. 1936, George Washington University

Roy Hertz, *Research Professor Emeritus of Pharmacology*
B.A. 1930, Ph.D. 1933, M.D. 1939, University of Wisconsin; M.P.H. 1940, Johns Hop
University

Henry William Herzog, *Vice President and Treasurer Emeritus*
B.S. in C.E. 1930, LL.D 1978, George Washington University

Thelma Hunt, *Professor Emeritus of Psychology*
B.A. 1924, M.A. 1925, Ph.D. 1927, M.D. 1935, George Washington University

Joe Lee Jessup, *Professor Emeritus of Business Administration*
B.S. in B.A. 1936, University of Alabama; M.B.A. 1941, Harvard University; LL.D. 19
University of Chungang, Korea

Eva Mayne Johnson, *Professor Emeritus of Psychology*
B.A. 1949, M.A. 1951, Ph.D. 1957, George Washington University

Everett Herschel Johnson, *Professor Emeritus of Statistics*
B.A. 1926, DePauw University; M.A. 1929, Lehigh University; Ph.D. 1942, University of Michig

Samuel Kavruck, *Professor Emeritus of Education*
B.S. 1937, M.S. in Ed. 1939, City University of New York, City College; M.A. in Govt. 1950, E
1954, George Washington University

Elmer Louis Kayser, *Professor Emeritus of European History; Dean Emeritus of the Division of University Students; University Historian*
B.A. 1917, M.A. 1918, LL.D. 1948, George Washington University; Ph.D. 1932, Colum
University; L.H.D. 1975, Mount Vernon College

Virginia Randolph Kirkbride, *Professor Emeritus of Educational Psychology*
B.A. 1941, M.A. 1942, University of Nebraska; Ed.D. 1959, George Washington University

George Martin Koehl, *Professor Emeritus of Physics*
B.A. 1931, University of North Carolina; M.A. 1933, George Washington University

Solomon Kullback, *Professor Emeritus of Statistics*
B.S. 1927, City University of New York, City College; M.A. 1929, Columbia University; Ph.D. 19
George Washington University

John Francis Latimer, *Professor Emeritus of Classics*
B.A. 1922, Litt.D. 1964, Mississippi College; M.A. 1926, University of Chicago; Ph.D. 1929, Y
University

Helen Bennett Lawrence, *Professor Emeritus of Physical Education for Women*
B.S. in P.E. 1934, M.A. 1938, George Washington University

Chester Elwood Leese, *Professor Emeritus of Physiology*
B.A. 1922, M.A. 1925, Ph.D. 1930, University of Iowa

Ralph Kepler Lewis, *Professor Emeritus of Anthropology*
B.A. 1934, Southwest Missouri State College; M.A. 1939, University of Southern California; Ph
1967, Columbia University

Calvin Darlington Linton, *Professor Emeritus of English; Dean Emeritus of Columbian College of Arts and Sciences*
B.A. 1935, George Washington University; M.A. 1939, Ph.D. 1940, Johns Hopkins Universit

Kurt London, *Professor Emeritus of International Affairs*
Ph.D. 1923, University of Würzburg

William Allan MacDonald, *Professor Emeritus of Art and Archaeology*
B.A. 1940, Oberlin College; M.A. 1942, Ph.D. 1943, Johns Hopkins University

Eugene Ross Magruder, *Associate Professor Emeritus of Business Administration*
B.B.A. 1950, M.B.A. 1951, University of Texas; Ph.D. 1959, Ohio State University

Anthony Marinaccio, *Professor Emeritus of Education*
Ed.B. 1937, Central Connecticut State College; M.A. 1939, Ohio State University; Ph.D. 1949, Yale University; LL.D. 1961, Parsons College

Muriel Hope McClanahan, *Associate Professor Emeritus of English*
B.A. 1935, Colorado College; M.A. 1937, Ph.D. 1940, University of Pittsburgh

Margaret McIntyre, *Professor Emeritus of Education*
B.S. in Ed. 1939, State University of New York at Buffalo; M.A. 1944, Northwestern University; A.P.C. 1963, George Washington University

Florence Marie Mears, *Professor Emeritus of Mathematics*
B.A. 1917, Goucher College; M.A. 1924, Ph.D. 1927, Cornell University

Howard Maxwell Merriman, *Professor Emeritus of American Diplomatic History*
B.A. 1930, M.A. 1931, University of Cincinnati; M.A. 1932, Ph.D. 1937, Harvard University

Franz Henry Michael, *Professor Emeritus of International Affairs and Far Eastern History*
Sinological Diploma 1930, University of Berlin; Referendar 1931, Dr.Jur. 1933, University of Freiburg

Edith Elizabeth Mortensen, *Professor Emeritus of Zoology*
B.A. 1925, Carleton College; M.A. 1927, University of Minnesota; Ph.D. 1945, George Washington University

Charles Rudolph Naeser, *Professor Emeritus of Chemistry*
B.S. 1931, University of Wisconsin; M.S. 1933, Ph.D. 1935, University of Illinois

Harry Robert Page, *Professor Emeritus of Business Administration*
B.A. 1941, Michigan State University; M.B.A. 1950, Harvard University; Ph.D. 1966, American University

Kittie Fenley Parker, *Professor Emeritus of Botany*
B.A. 1930, M.A. 1932, University of California, Berkeley; Ph.D. 1946, University of Arizona

Thomas Martin Peery, *Professor Emeritus of Pathology*
B.A. 1928, D.M.S. 1966, Newberry College; M.D. 1932, Medical University of South Carolina

Mary Louise Robbins, *Professor Emeritus of Microbiology*
B.A. 1934, American University; M.A. 1940, Ph.D. 1944, George Washington University

Daniel David Roman, *Professor Emeritus of Management Science*
B.S. in B.A. 1949, M.A. 1953, Ph.D. 1956, University of Southern California

Blake Smith Root, *Professor Emeritus of Education*
B.S. 1927, Monmouth College, Illinois; M.A. 1931, University of Illinois; Ed.D. 1948, George Washington University

Edward Henry Sehrt, *Professor Emeritus of German*
B.A. 1911, Ph.D. 1915, Johns Hopkins University

Benjamin Williams Smith, *Professor Emeritus of Biochemistry*
B.S. 1940, Virginia Polytechnic Institute and State University; M.S. 1947, Ph.D. 1951, George Washington University

Waldo Sommers, *Professor Emeritus of Public Administration*
B.A. 1927, Heidelberg College; M.A. 1934, Ph.D. 1948, Yale University

Edwin Lockwood Stevens, *Professor Emeritus of Speech*
B.A. 1936, Rutgers—The State University; M.A. 1942, Columbia University

Karl Ernest Stromsem, *Professor Emeritus of Public Administration*
B.A. 1930, Pomona College; Ph.D. 1935, University of California, Berkeley

Ira Rockwood Telford *Professor Emeritus of Anatomy*
B.A. 1931, M.A. 1933, University of Utah; Ph.D. 1942, George Washington University

Ronald Bettes Thompson, *Professor Emeritus of European History*
B.A. 1935, Yale University; Ph.D. 1954, University of Chicago

Rodney Tillman, *Professor Emeritus of Education*
B.A. 1943, Henderson State College; M.A. 1949, Ed.D. 1955, Columbia University

Kathryn Mildred Towne, *Professor Emeritus of Home Economics*
B.S. 1923, Montana State University; M.A. 1930, Columbia University

Carleton Raymond Treadwell, *Professor Emeritus of Biochemistry*
B.A. 1934, Battle Creek College; M.S. 1935, Ph.D. 1939, University of Michigan

William Lewis Turner, *Associate Professor Emeritus of English*
B.A. 1934, M.A. 1941, Ph.D. 1952, University of Pennsylvania

Robert Louis Weintraub, *Professor Emeritus of Botany*
B.S. 1931, M.A. 1933, Ph.D. 1938, George Washington University

Edward Ronald Weismiller, *Professor Emeritus of English*
B.A. 1938, Litt.D. 1953, Cornell College; M.A. 1942, Harvard University; D.Phil. 1950, Oxford University

Warren Reed West, *Professor Emeritus of Political Science*
B.A. 1918, George Washington University; Ph.D. 1922, Johns Hopkins University

Ralph Kirby White, *Professor Emeritus of Social Psychology*
B.A. 1929, Wesleyan University; Ph.D. 1937, Stanford University

Marvin Milton Wofsey, *Professor Emeritus of Management*
B.S. 1935, New York University; M.A. 1943, Ph.D. 1967, American University

Helen Bates Yakobson, *Professor Emeritus of Russian*
B.S. 1935, Harbin Law School, Manchuria

Donnell Brooks Young, *Professor Emeritus of Zoology*
B.S. 1911, Amherst College; Ph.D. 1923, Columbia University

ACTIVE*

Fred Paul Abramson, *Professor of Pharmacology*
B.A. 1962, Case Western Reserve University; Ph.D. 1965, Ohio State University

Eugene Abravanel, *Professor of Psychology*
B.A. 1955, University of Michigan; M.A. 1960, Swarthmore College; Ph.D. 1965, University of California, Berkeley

Zoila F. Ortega Acevedo, *Assistant Professorial Lecturer in Health Services Administration*
B.A. 1970, City University of New York, Queens College; M.A. 1972, New York University; M.Phil. 1979, Syracuse University

Andrew Stanford Adams, *Professorial Lecturer in Management Science*
B.A. 1949, Ed.D. 1954, University of California, Berkeley

Arvil Van Adams, *Research Professor of Education Policy and of Economics*
B.A. 1965, M.B.A. 1966, Memphis State University; M.A. 1968, Ph.D. 1970, University of Kentucky

William Clayton Adams, *Associate Professor of Public Administration*
B.A. 1971, M.A. 1972, Baylor University; Ph.D. 1977, George Washington University

Lewis Francis Affronti, *Professor of Microbiology*
B.A. 1950, M.A. 1951, State University of New York at Buffalo; Ph.D. 1958, Duke University

Yoshio Akiyama, *Professorial Lecturer in Mathematics*
M.A. 1963, Andrews University; Ph.D. 1967, University of Minnesota

Ernest Narinder Albert, *Professor of Anatomy*
B.S. 1959, High Point College; M.S. 1963, University of Pittsburgh; Ph.D. 1965, Georgetown University

John D. Albertson, *Adjunct Assistant Professor of Music*
B.M. 1981, Catholic University of America

Yousef Al-Doory, *Associate Professor of Pathology (Laboratory Medicine)*
B.S. 1945, University of Baghdad; M.A. 1951, University of Texas; Ph.D. 1954, Louisiana State University and Agricultural and Mechanical College

Frank Duane Allan, *Professor of Anatomy*
B.S. 1947, M.S. 1949, University of Utah; Ph.D. 1954, Louisiana State University and Agricultural and Mechanical College

Dean Conrad Allard, *Professorial Lecturer in History*
B.A. 1955, Dartmouth College; M.A. 1959, Georgetown University; Ph.D. 1967, George Washington University

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* The University Faculty is composed of the President of the University, the Vice President for Academic Affairs, the Director of Admissions, the Registrar, the University Librarian, the Treasurer, the Director of the Student Health Service, and the membership of the several college and school faculties. Faculty titles listed here represent 1984–1985 appointments.

John Gage Allee, Jr., *Professor of English*
B.A. 1939, M.A. 1940, George Washington University; Ph.D. 1955, Johns Hopkins University

Catherine Jean Allen, *Associate Professor of Anthropology*
B.A. 1969, St. John's College, Maryland; M.A. 1972, Ph.D. 1978, University of Illinois

Nejim M. Al-Sehrewerdi, *Visiting Professor of Human Kinetics and Leisure Studies*
M.S. 1948, University of Michigan; Ph.D. 1969, Martin Luther University, West Germany

David Aron Altshuler, *Associate Professor of Religion in the Charles E. Smith Chair of Judaic Studies*
B.A., M.A. 1971, Brown University; Ph.D. 1977, Hebrew Union College

Julia Altagracia Alvarez, *Jenny McKean Moore Visiting Lecturer in Creative Writing*
B.A. 1971, Middlebury College; M.A. 1975, Syracuse University

Frederick Amling, *Professor of Business Finance*
B.A. 1948, Baldwin-Wallace College; M.B.A. 1949, Miami University; Ph.D. 1957, University of Pennsylvania

Alex Anckonie III, *Visiting Assistant Professor of Business Administration*
B.S. 1959, University of Michigan; M.B.A. 1981, American University; D.B.A. 1984, George Washington University

Jeffrey Clifford Anderson, *Associate Professor of Art*
B.A. 1970, University of Pittsburgh; M.F.A. 1973, Ph.D. 1976, Princeton University

W. French Anderson, *Adjunct Professor of Genetics*
B.A. 1956, M.D. 1963, Harvard University; M.A. 1960, Cambridge University

William A. Anderson, *Assistant Professor of Economics*
B.A. 1974, Yale University; M.A. 1980, Ph.D. 1983, Cornell University

Avery DeLano Andrews, *Associate Professor of History; Assistant Dean of the Graduate School of Arts and Sciences*
B.A. 1950, Harvard University; LL.B. 1953, M.A. 1958, Ph.D. 1962, University of Pennsylvania

Dennis P. Andrulis, *Assistant Professorial Lecturer in Health Services Administration*
B.S. 1969, Fordham University; Ph.D. 1973, University of Texas; M.P.H. 1976, University of North Carolina

Edward Angel, *Assistant Professorial Lecturer in History*
B.A. 1968, University of Maryland; Ph.D. 1979, George Washington University

John Lawrence Angel, *Professorial Lecturer in Anatomy and Anthropology*
B.A. 1936, Ph.D. 1942, Harvard University

David Victor Appel, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1972, Bennington College; M.A. 1977, Goddard College

Daniel Appleman, *Professorial Lecturer in Geology*
B.S. 1953, California Institute of Technology; M.A. 1954, Ph.D. 1956, Johns Hopkins University

Joseph Aschheim, *Professor of Economics*
B.A. 1951, University of California, Berkeley; M.A. 1953, Ph.D. 1954, Harvard University

Hossein G. Askari, *Professor of Business Administration*
B.S. in C.E. 1966, Ph.D. 1970, Massachusetts Institute of Technology

Muriel Ann Atkin, *Associate Professor of History*
B.A. 1967, Sarah Lawrence College; M.Phil. 1971, Ph.D. 1976, Yale University

David Lynn Atkins, *Professor of Biology*
B.A. 1957, University of Texas; M.A. 1963, East Texas State University; Ph.D. 1970, Texas A&M University

A.M. Attallah, *Adjunct Professor of Genetics*
B.S. 1967, Alexandria University, Egypt; D.E.A. 1971, University of Paris; Ph.D. 1974, George Washington University

Julius Axelrod, *Distinguished Professor of Science; Professorial Lecturer in Pharmacology*
B.S. 1943, City University of New York, City College; M.A. 1941, New York University; Ph.D. 1955, LL.D. 1971, George Washington University; Sc.D. 1966, University of Chicago

Ines Azar, *Associate Professor of Spanish*
M.A. 1969, Ph.D. 1974, Johns Hopkins University

William Back, *Adjunct Professor of Geology*
B.S. 1948, University of Illinois; M.S. 1955, University of California, Berkeley; M.P.A. 19
Harvard University; Ph.D. 1969, University of Nevada

Barbara A. Bailar, *Professorial Lecturer in Statistics*
B.A. 1956, State University of New York at Albany; M.S. 1965, Virginia Polytechnic Institute a
State University; Ph.D. 1972, American University

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National Law Center, Admissions Office, National Law Center

School of Medicine and Health Sciences, Admissions Office, School of Medicine and Health Sciences

Schedule of Classes (On Campus), Fall and Spring Semesters, Registrar

Schedule of Classes (Off Campus), Fall, Spring, and Summer, Division of Continuing Education and Summer Sessions

Schedule of Classes (Summer Sessions), Summer Sessions Office

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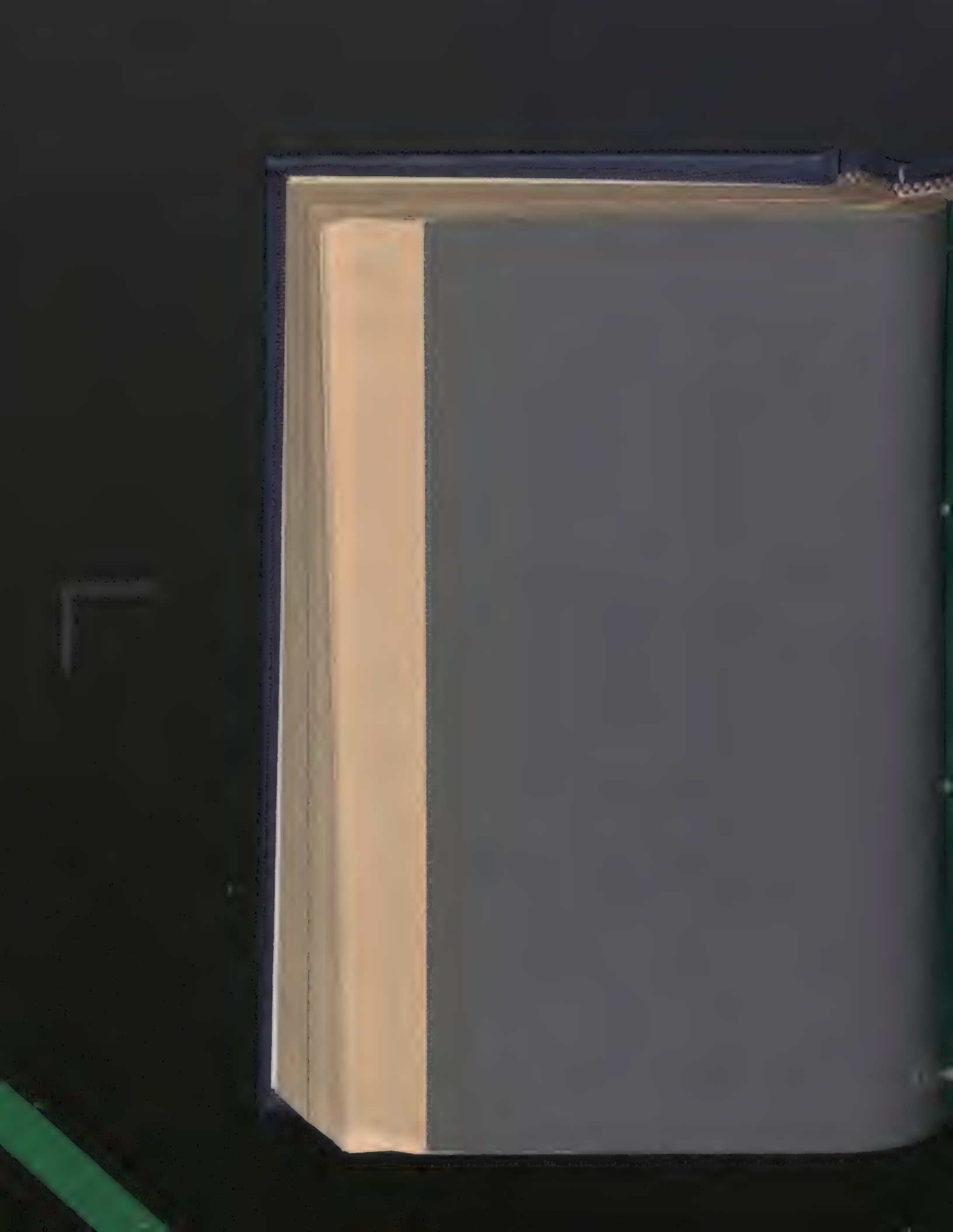
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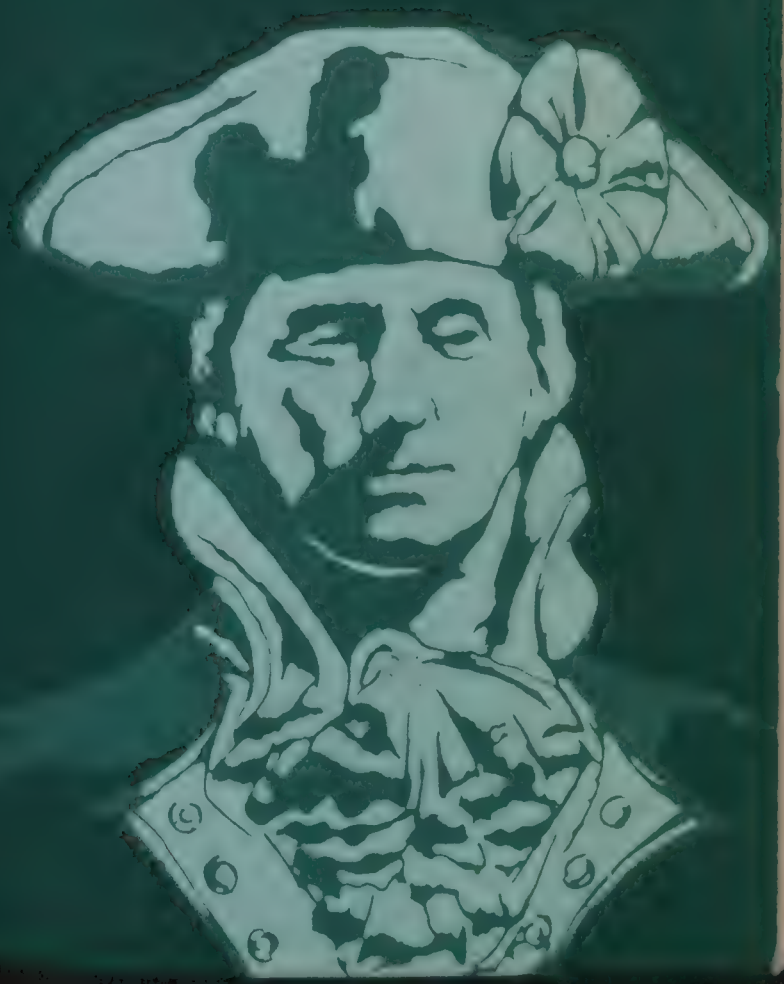
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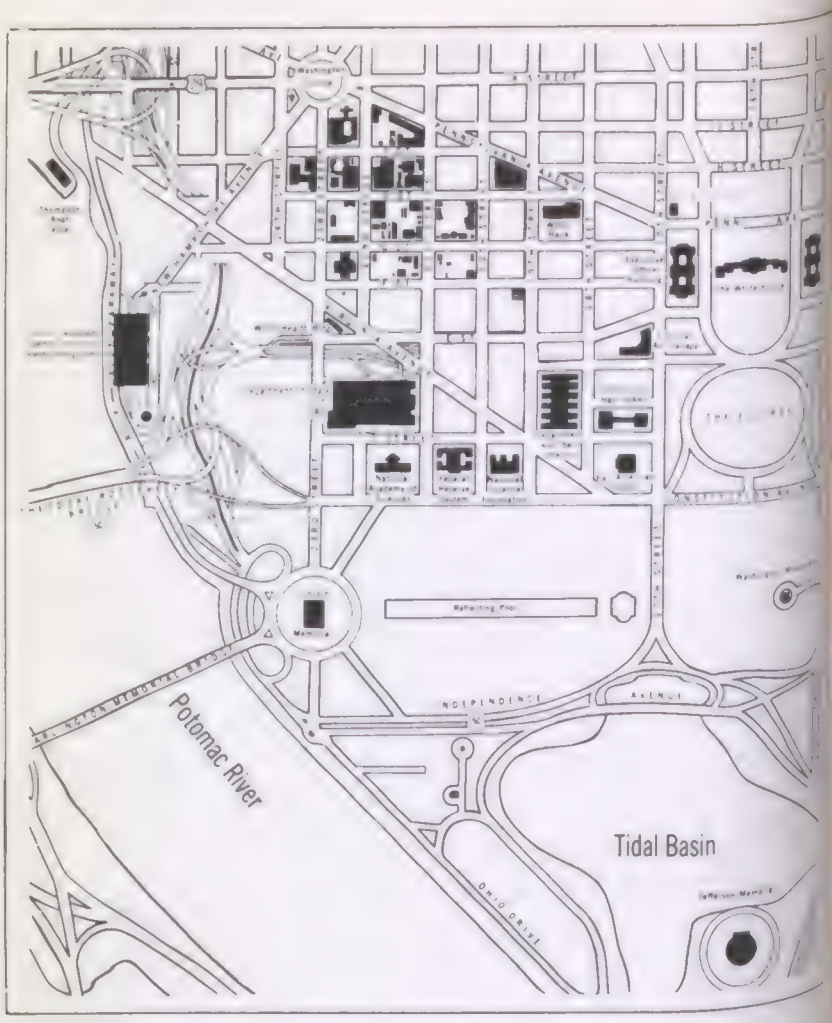


The George Washington University

School of Medicine and Health Sciences Bulletin

1985–1986





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School of Medicine and Health Sciences Bulletin
September 1985

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1985–1986

Washington, D.C. 20052

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July 8	Beginning of third- and fourth-year clerkships
August 21–23	Orientation and registration for first-year students
August 26	First day of classes for first- and second-year students
September 2	Labor Day (holiday)
September 3	Registration for second-year students
November 27	Thanksgiving vacation begins after classes for first- and second-year students
December 2	Classes resume for first- and second-year students
December 13	Last day of classes for first- and second-year students
December 16–20	Examination period for first- and second-year students
December 20	Winter vacation begins at 5:00 p.m. for first- and second-year students
January 6	Classes resume for first- and second-year students
January 9	Spring registration for first- and second-year students
February 17	George Washington's Birthday (holiday)
March 7	Spring break begins after classes for first- and second-year students
March 17	Classes resume for first- and second-year students
May 23	Commencement Last day of classes for first- and second-year students
May 26	Memorial Day (holiday)
May 27–30	Examination period for first- and second-year students
June 10–11	NBME Part I Exam for second-year students
June 27	End of third-year clerkships

* This calendar is subject to change. Although registration is conducted in both August and January, there is no precise date for the end of the fall semester; some courses end before winter recess whereas others begin before January registration.

The University

History and Organization

The George Washington University had its beginning in 1821 as the Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to the George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a national university in the federal city. There he hoped that while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining firsthand a knowledge of the practice and theory of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of the Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted the charter that was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character, it provided "That persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and one-half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half-century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. Within a few blocks are the White House, the Department of the Interior, the State Department, the World Bank, and many other governmental offices and international agencies. The area has many reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street. The first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the pastor of a church at Nineteenth and

Eye Streets, and Washington selected Twenty-third and E Streets as the site of the National University he had hoped to see established.

The University as it is now organized consists of Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center and the schools of Medicine and Health Sciences, Engineering and Applied Science, Education and Human Development, Government and Business Administration, and Public and International Affairs; and the Division of Continuing Education.

The George Washington University is privately endowed and is governed by a self-perpetuating Board of Trustees of which the president is an *ex officio* member.

Academic Status

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools. The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board. The Department of Chemistry is on the approved list of the American Chemical Society.

The School of Medicine and Health Sciences has had continuous approval by the Council on Medical Education of the American Medical Association and the Association of American Medical Colleges. The Doctor of Medicine degree of the School of Medicine and Health Sciences is recognized by all state and territorial medical licensure boards in the United States.

University Policy on Equal Opportunity

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the University, including admission to educational programs and employment. The University is also subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Dr. Marianne Phelps, Associate Provost, George Washington University, Rice Hall, Washington, D.C. 20052, or to the Assistant Secretary for Civil Rights of the Department of Education.

Cloyd Heck Marvin Center

The Cloyd Heck Marvin Center serves as the campus community center providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board, the academic departments, and student and faculty organizations.

The Center Governing Board, representative of all elements of the University community, plays an important role in the day-to-day functioning of the center. This board works closely with the full-time staff in the development of the procedures and policies that provide a framework for the center's operation.

Recreation

The nation's capital provides abundant recreational resources, a large number of which are available at little or no cost. There are numerous art galleries, museums, concert halls, theaters, swimming pools, parks, and places of historic interest. Social activities are provided by student organizations of the University, the School of Medicine and Health Sciences, and University-sponsored programs such as intramural sports, concerts, recitals, and dramatic productions. Washington is one of the most colorful cultural and scientific centers of the world.

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The School of Medicine and Health Sciences

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The Vice President and Executive Dean is the chief executive officer of the Medical Center, with overall responsibility for all programs of the Center. As chief executive officer, the Vice President is also the recipient of the Walter A. Bloedorn Professorship of Administrative Medicine, established by the Walter A. Bloedorn Foundation in memory of the late Dean of the Medical Center.

Office of Academic Affairs

The Office of Academic Affairs bears the responsibility for the curriculum; student affairs, including scholarship and financial aid; research and sponsored programs; allied health programs; educational evaluation; admissions; and support services of the library and audiovisual and animal facilities.

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Office of Clinical Affairs

The Office of Clinical Affairs is responsible for the patient care activities of the University Hospital and the Medical Faculty Associates and for the supervision of the graduate and continuing medical education programs and community affiliation programs.

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History

The School of Medicine and Health Sciences of the George Washington University has a distinguished history that goes back more than a century and a half. In March 1825 the School opened with the intention of building "a medical school commensurate with the progress and demands of a rising metropolis, and the improvement of service throughout the country." The School, the eleventh oldest medical school in the country, has met this responsibility by providing its students with a foundation in the medical sciences on which they have built medical careers in practice, teaching, research, or administration.

In 1844 the School took on a new dimension when Congress granted it the use of the Washington Infirmary. Thus one of the earliest general teaching hospitals in the nation was established in Washington.

The distinguished history of the George Washington University School of Medicine and Health Sciences closely parallels the academic advances and medical progress of the nation. The School has contributed to both.

The George Washington University Medical Center, established in 1966, consists of Walter G. Ross Hall, which houses the School of Medicine and Health Sciences; the Paul Himmelfarb Health Sciences Library; the University Hospital; the H.B. Burns Memorial Building, which houses the Medical Faculty Associates; the Helen L. and Mary E. Warwick Memorial Building, and affiliated hospitals.

In 1973, with the introduction of undergraduate programs in allied health sciences, the name of the School was officially changed from the School of Medicine to the School of Medicine and Health Sciences.

Regulations

A student enrolled in the University is required to conform to the following regulations and to comply with the rules and regulations of the college, school, or division in which he or she is registered.

A student who withdraws or is suspended, or is otherwise absent from the University for one semester or more, may reenter and continue scholastic work only under the regulations and requirements in force at the time of return.

If a student knowingly makes a false statement or conceals material information on an application for admission, registration card, or any other University document, the student's registration may be canceled. If such falsification is discovered after the student has established an academic record at the University, the student may be subject to dismissal from the University. Such a student will be ineligible (except by special action of the faculty) for subsequent registration in the University.

Registration

Attendance in class requires compliance with the School's registration deadlines.

University Policy on the Release of Student Information

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions that are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate; and
3. receive the student's written consent before releasing information from his or her education records to persons outside the University, except for directory information as indicated below (information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency); and
4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; number of semester hours of credit earned; degrees earned; honors



received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height and weight of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

Right to Dismiss Students

The right is reserved by the University to dismiss or exclude any student from the University or from any class or classes whenever, in the interest of the student or the University, the University Administration deems it advisable.

Right to Change Rules

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

Right to Make Changes in Programs

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

Definition of Satisfactory Academic Progress and Good Standing

Medical education at the George Washington University School of Medicine and Health Sciences is demanding, and student progress is carefully monitored. Therefore, any matriculated student who has not withdrawn or been dismissed is considered in good standing and making satisfactory academic progress. No student is allowed to continue his or her course work at the School if he or she is considered by the faculty of the School not to be capable of attaining the M.D. degree. This policy is fully consistent with the Regulations for M.D. Candidates. Federally regulated financial assistance programs will not be approved for students who are not in regular attendance and do not meet the School's standards for good standing and satisfactory academic progress.

University Policy on Drugs

The University cannot condone violations of law, including violation of those laws that proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken to protect the interests of the University and the rights of others.

The Libraries

Students have the privilege of using the Melvin Gelman Library and the Paul Himmelfarb Health Sciences Library. The stacks are open, and all students are welcome to browse at their leisure. A card denoting approved enrollment for the current semester must be presented when books are borrowed for outside use.

All students using the libraries are expected to be familiar with the regulations governing their use, which are available at each library.

Property Responsibility

The University is not responsible for the loss of personal property. A Lost and Found Office is maintained on campus in the Safety and Security Office.

Student Affairs

The Office of the Vice President for Student Affairs develops student life programs, policies, and procedures to complement the University's formal instruction program. These activities are implemented through the offices of the Cloyd Heck Marvin Center, Counseling Center, Dean of Students, Educational Opportunity Program, Housing and Residence Life, International Student Services, Student Activities, Alumni Relations, Career Services Center, Student Health Service, and Disabled Student Services. More detailed information on these and other activities is contained in the *Student Handbook*.

Student Health Service

The Student Health Service is an outpatient clinic located at 908 New Hampshire Avenue, N.W., telephone 676-6827. All students enrolled in on-campus programs who have been issued student IDs are eligible to use the service. A current ID must be presented at each visit.

The Health Service medical staff consists of physicians, nurse practitioners, physician assistants, and an RN. Evaluation and treatment of health problems or, when indicated, referrals to appropriate specialists are provided. A psychiatrist is available for mental health concerns. X-rays, lab tests, and medications prescribed by Health Service providers are available at the clinic or at nearby facilities. Outside prescriptions cannot be filled.

The Health Service operates on an appointment basis, but emergency patients are seen without appointment. There is no charge for visits, and fees for supplies and medications provided by the Health Service are at cost. Bills incurred for x-rays, lab work, and referrals to specialists are the responsibility of the student. The service is open from 9 a.m. to 5 p.m., Monday through Friday, and during busy months there are additional walk-in hours for emergencies. If a serious emergency occurs when the clinic is closed, a student is responsible for charges incurred and so should take insurance information along.

Health and Accident Insurance

The University has arranged for group health and accident insurance for those full-time students who do not have other coverage. Students are required to carry adequate health insurance coverage for themselves and, if married, for their spouses and children. Interested students should contact the Student Health Service.

Housing for Undergraduate Allied Health Students

Complete information concerning the University's residence halls is available from the Director of Housing and Residence Life, George Washington University, Washington, D.C. 20052. Information concerning off-campus housing may also be obtained at this Office. Arrangements for private housing must be made by students.

Admission to the University does not include a room reservation. The student will receive, with notification of acceptance, University residence hall information, an application for residence hall space, and a declaration of intent to attend the University. The application for residence hall space or apartment accommodations must be accompanied by a $200 ***nonrefundable deposit***. The housing deposit is either credited toward the first semester's room charge or held as a security deposit on an apartment. Rooms and apartments are leased for the academic year, September to May, and lease payment must be made in early June for the fall semester, unless the student elects the deferred payment plan or the 10-month payment plan. Please check with the Student Accounts Office for the 10-month payment plan. Physician assistant and nurse practitioner applicants are not encouraged to apply for University housing in view of their extended academic year.

1985–86 Residence Hall Rates per Person for Two Semesters*

For Men

Calhoun Hall	
double room	$2,530
triple room	2,450

For Women

Strong Hall	
single room	$2,730
double room	2,530
triple room	2,450

For Men and Women

Crawford Hall	
double room	2,530

*Residence hall prices and allocation are subject to change.

Everglades Hall*	
triple room	2,530
Guthridge Hall* (limited to juniors and seniors)	
apartment for one person	2,920 or 2,850
apartment for two persons	2,800
apartment for three persons	2,550
Building JJ (limited to sophomores, juniors, and seniors)	
apartment for two or four persons	2,670
apartment for six persons	2,450
Francis Scott Key Hall (limited to juniors and seniors)	
apartment for one person	2,920
apartment for two or three persons	2,800
Madison Hall	
double room	2,530
triple room	2,450
Milton Hall*† (limited to juniors and seniors)	
apartment for two persons	2,700
apartment for three persons	2,550
Mitchell Hall	
single room	2,730
Munson Hall*† (limited to juniors and seniors)	
apartment for two persons	2,700
apartment for three persons	2,550
Thurston Hall	
double room, triple room, room for four or five	2,530

Food Service‡

Resident freshman and sophomores are required to choose one of the following three food service plans: the seven-day, 19 meals per week plan, at the rate of $1,830 for the academic year; the any 14 meals per week plan for $1,762 for the academic year; any 10 meals per week plan at $1,714; or the any seven meals per week at $1,604 for the academic year. Participation in the food service plans is optional for junior, senior, and graduate students and for all students assigned to apartments. Food service payment does not cover University intersession or vacation periods. All meal cards admit the bearer to dining rooms in Thurston and Mitchell Halls and to the second-floor contract dining room in the Cloyd Heck Marvin Center. Meal cards may also be used on a cash equivalency basis in the Marvin Center first-floor cafeteria and in the Rathskellar George's.

Students who observe the Jewish dietary laws can write to make arrangements with the George Washington University Office of Housing and Residence Life regarding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

*Residents must deal directly with the telephone company and pay all costs associated with telephone service.

†Residents must pay electricity bills (which do not include the cost of heating) in addition to the rental rate.

‡Food service prices are subject to change.

Veterans Benefits

The Veterans Benefits Office, administered by the Office of Student Financial Aid, is located on the third floor of Rice Hall, 2121 Eye St., N.W. The Office assists students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any problems that may arise concerning their benefits. The Office also processes certification of enrollment and attendance to the Veterans Administration so that educational allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting an application to the Veterans Administration. All such students should obtain from the veterans counselor the instruction sheet that sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and includes other information of general interest.

The Veterans Administration is located at 941 North Capitol St., N.E., Washington, D.C. 20421.

Facilities

Walter G. Ross Hall

Walter G. Ross Hall was dedicated and opened in 1973. This facility provides the teaching and laboratory facilities for students in the School of Medicine and Health Sciences. It occupies a city block on the northwest edge of the University campus; its gross area is approximately 550,000 square feet, or more than 10 acres. The building is equipped with audiovisual and other teaching equipment as well as basic science laboratories.

Educational Support Services

Educational Support Services is a group of core facilities and services supportive of the educational, clinical, and research missions of the Medical Center. Coordinated by the Associate Dean for Education, the services include the Office of Education, the Office of Audiovisual Education, the Office of Academic Computer Services, and the Paul Himmelfarb Health Sciences Library.

Office of Audiovisual Education and Services, Frank D. Allan, Ph.D., Director—The goal of this Office is to facilitate learning and communication throughout the Medical Center by appropriate application of media technology. Consultation is provided in the use of nonprint media in educational, clinical, and research programs. The Office provides for display of audiovisual materials and programs in classrooms throughout the Medical Center. It has highly developed production capabilities that are available to students, faculty, and staff and that include photographic, illustration, cinematographic, and television studios and a print shop. Virtually all learning spaces at the Medical Center are equipped for still and motion projection and television display. Spaces subject to frequent use are equipped with permanent systems for projection, sound amplification, and recording designed to support staff and student presentations.

Office of Academic Computer Services, Helmuth F. Orthner, Ph.D., Director—This Office supports educational activities of the Medical Center with services such as educational testing, maintenance of test-item data banks, assistance in the design, construction, and duplication of written PMP examinations, student feedback evaluation, course registration, CME credit reporting, conference management support, and automation of library procedures and inventories. The Office also supports small research data bases for investigations requiring interactive data maintenance or for projects using forms that can be optically scanned. Sophisticated statistical processing can be achieved by transmitting research data to the GWU Center for Academic and Administrative Computing's IBM mainframe with our on-line communications interface and processing the data with the appropriate statistical package. The Office also has facilities for word processing and a number of interactive psychodiagnostic questionnaires and histories for use by research investigators. It serves as an interface for computer-assisted educational material from the Massachusetts General Hospital and the Ohio State University.

The facilities of the Office consist of an on-line optical scanner (NCS 7001), a DEC PDP 11/60 minicomputer using the ANSI STANDARD MUMPS language environment, an on-line RJE 3780 communications link to the University Center for Academic and Administrative Computing (IBM 4341), a Gandalf communications facility to connect terminals from various locations of the School via dedicated lines using high-speed modems, and several dial-up ports for the switched telephone network.

Office of Education, Rhonda M. Goldberg, M.A., Director—The primary task of the Office of Education is to work with faculty and students to improve the educational enterprise. The Office conducts evaluations of courses and curricula and works toward the establishment of effective systems for evaluating student performance. Consultation is provided to faculty in support of their teaching skills, to students in support of their efforts to learn, and to the Office of Academic Affairs in support of its administration of the educational program.

Paul Himmelfarb Health Sciences Library, Shelley Bader, M.L.S., Director—The Library's collection of more than 120,000 volumes and approximately 1,400 journal subscriptions serves the educational, research, and patient care needs of the Medical Center. These resources are further enhanced by audiovisual media housed in the Library's Bloedorn Audiovisual Study Center, which supplement and complement the educational programs of the School of Medicine and Health Sciences.

Specialized information services are provided through computerized on-line bibliographic services that access a multitude of bibliographic and information data bases, including MEDLINE, produced by the National Library of Medicine (NLM). The Himmelfarb Library is an active participant in NLM's Regional Medical Library Program, which facilitates interlibrary borrowing to meet the need for materials not available within users' libraries.

Through formal class presentations and instruction provided on an individual basis, the library staff instructs users in effective use of materials and research strategies to meet specific information needs. Special student services include an extensive collection of reserve materials designed to assist students with curriculum needs. In addition, the Library works closely with the Office of Education to provide materials to assist students with their educational planning.

The Himmelfarb Library, located adjacent to Ross Hall, can accommodate approximately 400 users. Facilities include a smoking lounge, a typing room, a conference room, group study rooms, and individual study carrels.

The George Washington University Hospital

The George Washington University Hospital is adjacent to the School of Medicine and Health Sciences and is an acute care facility with 503 adult beds and 56 bassinets. It serves as the primary teaching site for students in the School of Medicine and Health Sciences and for more than 400 physicians participating in the 19 accredited postgraduate training programs offered by the Medical Center. The Hospital records approximately 20,000 patient admissions each year and provides a broad range of tertiary care services to an equally broad-based patient population. Patient origin studies indicate a concentration of patients from Washington, D.C., and suburban Maryland; but the actual hospital service area extends well into the entire Washington metropolitan area, and patients come from all states of the nation and several foreign countries.

The Medical Faculty Associates (MFA) is a private group practice of 195 full-time physicians who practice exclusively at the Hospital and are dedicated to its mission of education and quality patient care. The MFA physicians comprise the full-time clinical faculty at the Medical Center and represent all medical specialties, including the hospital-based specialties of radiology, pathology, anesthesiology, and emergency medicine. The MFA physicians receive approximately 110,000 patient office visits annually. The emergency medicine group staffs the Hospital Emergency Unit—one of the busiest in the city—and contributes another 42,000 visits per year. The MFA physicians' offices are consolidated in the 13-story H.B. Burns Memorial Building, adjacent to the University Hospital.



The George Washington University Health Plan (GWUHP) is a health maintenance organization that was begun in 1972 to provide patient care and to provide students and house staff with educational experience in a prepaid health plan setting. The GWUHP has more than 20,000 subscribers.

The Helen L. and Mary E. Warwick Memorial Building

This building houses a computerized multitest facility, which is available to physicians for patient evaluation.

Affiliated Hospitals

Children's Hospital National Medical Center—Children's Hospital represents the Department of Child Health and Development at George Washington University School of Medicine and Health Sciences and offers a comprehensive clerkship experience for third-year students and a variety of elective opportunities in the fourth year. The hospital provides primary and tertiary care to children in the greater Washington area and is a referral center for children throughout the world.

Fairfax Hospital—This 656-bed voluntary community teaching hospital, part of a three-hospital system, serves a burgeoning suburban area and provides all clinical services, including psychiatry. Each year more than 31,000 patients are admitted for treatment, 6,200 babies are delivered, 21,300 surgical operations are performed, and 60,000 persons are examined and treated in the Emergency Suite. Fairfax Hospital offers a rotating internship program, a School of Medical Technology, and clinical facilities for a School of Practical Nursing. Students of the School of Medicine and Health Sciences serve at this hospital in clinical clerkship and elective programs. Fairfax Hospital is an affiliated hospital for residency training in obstetrics and gynecology in the George Washington University Medical Center Program.

Holy Cross Hospital—Holy Cross, a modern 450-bed hospital, is a primary clinical campus that provides students with firsthand exposure to the practice of medicine in the community. It is a private, voluntary facility in which the full range of medical, surgical, and pediatric services is provided for a growing suburban population. Last year more than 20,000 patients were hospitalized, nearly 43,000 emergency visits were registered, and 3,953 babies were delivered at Holy Cross. The hospital has consistently experienced one of the highest occupancy rates in the metropolitan area.

National Naval Medical Center—The National Naval Medical Center, Bethesda, Maryland, is a 500-bed general hospital that offers a wide range of specialized services, clinical research, and educational programs. Medical care is provided to active-duty and retired military personnel and their dependents. It is a major referral center for thoracic and cardiovascular surgery as well as for cancer therapy. The teaching staff directs internship, residency, and fellowship programs in 25 specialties.

Saint Elizabeths Hospital—Saint Elizabeths Hospital, established by an 1852 Act of Congress, is a federal psychiatric hospital funded by and administered under the Department of Health and Human Services. This hospital provides for the treatment and care of approximately 5,000 persons, largely residents of the District of Columbia, of whom approximately 1,600 are inpatients in residence at any time. The Hospital staff includes a variety of specialists and support personnel, who enable it to conduct psychiatric evalua-

tions and deliver treatment using a wide range of therapeutic modalities. The hospital maintains an up-to-date health sciences library.

Medical students of George Washington University use the facilities of Saint Elizabeths for part of their clinical psychiatric training. A continuing research program is conducted at the hospital under a cooperative arrangement with the National Institute of Mental Health.

Veterans Administration Medical Center—In addition to providing medical, surgical, psychiatric, neurological, tubercular, and physical medicine and rehabilitation services, this 708-bed medical center has a large outpatient program; an extensive medical research program; programs in open-heart surgery, cobalt therapy, and renal dialysis; a metabolic program; and a specially designed Administrative Research Laboratory.

Washington Hospital Center—This 910-bed private, not-for-profit institution serves the greater Washington area through patient care, teaching, and research. The Center is the busiest hospital in the area, with approximately 30,600 admissions each year. An active emergency department treats more than 44,000 patients annually, and a separate facility for acute resuscitation of critically ill and injured patients treats another 1,000 each year. A 74-bed intensive care tower supports not only the trauma and medical services but also the very active cardiology and open-heart surgery programs and the area's only adult burn service. The center offers approved postgraduate programs in all specialties except psychiatry and pediatrics for 205 residents and fellows. In addition, clinical rotations or teaching programs are provided for nurses, medical technologists, x-ray technicians, and other allied health professionals.

Committees 1984–85

Academic Freedom and Ethics

J. Wiener *(Chairman)*, N. Kramer, K. Peusner, H. Pierpont, R. Scalettar, H. Sidransky, T. Silber

Admissions and Advanced Standing

A. Thompson *(Chairman)*, F. Abramson, J. Crantz, O. Donnelly, M. Fuchs, J. Giordano, F. Green, K. Johnson

Allied Health Programs

T. Moody *(Chairman)*, H. Chen, M. Cianci, C. DeAtley, G. Herer, T. Johnson, P. Klubes, D. Millon, M. Reich, S. Silver, I. Tamagna, D. Watkins

Appointments, Promotions, and Tenure

J. Ott *(Chairman)*, L. Affronti, D.O. Davis, V. Cohn, B. Dunbar, J. Ramey, C. Tuazon

Bylaws

S. Kent *(Chairman)*, R. Kenney, G. Wagner, W. Yamamoto, J. Zacharia

Communications and Educational Resources

M. Edwards *(Chairman)*, F. Allan, S. Bader, J. Kelleher, H. Orthner, W.H. Scott, C. Smith, R. Valentino

Continuing Medical Education

D. Ein *(Chairman)*, B. Aaron, R. Dyer, E. Hinman, R. Kaufman, S. Koulouris, P. Labropoulos, R. Rosenthal, C. Silva, S. Silver

Educational Evaluation

G. Walker, *(Chairman)*, B. Blatt, M. Davis, G. Gabe, L. Gallo, F. Green, S. Kent, P. Kind, A. Kwart, R. Lavine, H.G. Mandel, W. Olmsted, G. Povar, J. Rheingold, C. Thompson, H. Trout, R. Walsh, P. White, J. Wiener

Educational Planning

H. Trout *(Chairman)*, M. Davis, E. Druy, H. Emsellem, L. Greenberg, R. Hendron, S. Irani, S. Karmi, A. Medinger, J. Orenstein, G. Pawlson, J. Rosenstein, R. Shesser, C. Spiegel, J. Straw, G. Wagner, G. Walker, A. Wasserman, D. Watkins, J. Wise

Graduate Medical Education

R. DePalma *(Chairman)*, J. Frank, F. Slaby

Public Relations

M.E. Tidball *(Chairman)*, P. Gross, K. Kennedy, D. Lee, S. Lugerner

Student Affairs

P. Kline *(Chairman)*, J. Becker, M. Fuchs, W. Hix, E. Kushner, S. Lerner, Y. Oertel, D. Simon, G. Wagner

Research

P. Kind *(Chairman)*, E. Bradley, G. Fiskum, G. Geelhoed, S. Hurwitz, K. Kennedy, D. Lee, L. Lessin, R. Riegelman, G.C. Rosenquist, R. Stillman, R. Walsh

Alumni and Allied Associations

The General Alumni Association

The objectives of this Association are to promote the general welfare of the University and to unite graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes.

Eligible members are those who have enrolled in any school of the University and who have left the University in good standing and any person who is or has been a member of the teaching, research, or administrative staff of the University or of the Board of Trustees of the University.

The affairs of the Association are directed by the Governing Board, the majority of whose members represent the constituent alumni organizations of the University's schools and colleges.

The voluntary leadership of the Association works closely with the staff of the Alumni Relations Office in carrying out Association affairs. The Association may be contacted through the Alumni Relations Office.

The George Washington University Medical Alumni Association

The George Washington University Medical Alumni Association, incorporated in 1959, continues the organization previously known as the George Washington University Medical Society.

The stated purposes of the Association are as follows:

> This shall be a nonprofit organization international in scope, whose objectives shall be to provide constructive services for the M.D. degree alumni of the George Washington University School of Medicine and Health Sciences for furthering the art and science of medicine, research, and for the promotion of the welfare of the George Washington University School of Medicine and Health Sciences, its students, the George Washington University Hospital and its trainees.

Active membership in the Association consists of all M.D. degree graduates of the School of Medicine and Health Sciences; current members and, on application, past members of the teaching staff of the School of Medicine and Health Sciences who hold doctoral degrees; and doctors of medicine who have had one or more years of postgraduate training in the George Washington University Hospital. Junior membership consists of all members of the student body of the M.D. degree program of the School of Medicine and Health Sciences.

The Medical Alumni Association maintains an office in the School of Medicine and Health Sciences.

Officers for 1984–85

President: Allan Zellis, M.D. 1941

Council

Wayne D. Blackmon, M.D. 1978
William H. Cooper, M.D. 1949
Marvin Footer, M.D. 1942
Jack Kleh, M.D. 1944
Ronald Kurstin, M.D. 1971
Sidney Levine, M.D. 1941
Allen Mondzak, M.D. 1961
Beale H. Ong, M.D. 1959
Stephen Pappas, M.D. 1956
Dee R. Parkinson, M.D. 1943

Alvin Parrish, M.D. 1945
David H. Robb, M.D. 1958
John Umhau, M.D. 1952



The Doctor of Medicine Degree Program

Admission

The George Washington University School of Medicine and Health Sciences seeks to enroll intellectually gifted, humanly sensitive, mature persons who will excel in the science and art of medicine. Applicants of diverse social and educational backgrounds have access to the admissions process. In the selection process there is no discrimination based on sex, race, color, religion, age, marital status, national or regional origin, or handicap.

An admissions brochure is available yearly and contains detailed information regarding the requirements and application process as well as useful information concerning our program, the curriculum, etc. Interested persons are urged to review this document.

Entrance Requirements

Admission to the First-Year Class

For admission to the Doctor of Medicine degree program, a minimum of 90 semester hours must have been earned in an accredited American or Canadian institution of higher learning. Credits earned in a professional school can be applied to the fulfillment of this minimum requirement only if they are acceptable by the applicant's college or university toward a bachelor's degree in arts or science. (A credit under the quarter system is two-thirds of a semester hour.) It is advantageous to complete four full years of undergraduate study. Only exceptional students are accepted upon completion of the minimum requirements.

It is possible for exceptional students with three years of undergraduate work in Columbian College of George Washington University to be admitted to this medical school and to receive a combined Bachelor of Arts–Doctor of Medicine degree. More detailed information on this program is given on page 28.

An early selection program enables George Washington University undergraduates to apply to the medical school at the end of the sophomore year. Those students accepted create a broad and vigorous program tailored to promote intellectual growth during their last two years in college. After graduation, they can matriculate into the M.D. program. Applications and letters of evaluation are due in mid-May. Contact the Office of Admissions.

The following courses must be completed with satisfactory achievement before the applicant can be certified for matriculation. All required science courses must include sufficient laboratory work to give assurance of familiarity with the experimental methods and techniques of the disciplines.

Biology—Eight semester hours, including two semester hours of laboratory. This may be either in general biology or zoology but may not include separately credited courses in botany.

Chemistry—Eight semester hours of general inorganic chemistry (which may include qualitative analysis), including two semester hours of laboratory and six to eight semester hours of organic chemistry, including laboratory

Physics—Eight semester hours, including at least two semester hours of laboratory.

English—Six semester hours in composition and literature. This may be the usual introductory college course or its equivalent.

The number of required courses has been kept to a minimum to allow college students the time to pursue their own interests in depth. The Admissions Committee has no preference with regard to the major area of study of the applicant. Students with backgrounds in the arts, humanities, and social sciences are as admissible as applicants with science backgrounds. The Committee does expect that work in the student's chosen area of concentration as well as in the required science courses will reflect scholarly interests and show evidence of significant achievement.

Applicants must submit scores on the Medical College Admission Test (MCAT). MCAT scores will be valid only if the test was taken within three years of the date of expected matriculation.

Admission with Advanced Standing

Students are accepted with advanced standing to the second or third year. Most acceptances are for second-year places. Guidelines for applying are published by the Office of Admissions in January.

Application Procedure

Application to the First-Year Class

Application forms are available from the Office of Admissions. All applicants are reminded that the submission of materially false or misleading information in application forms or in connection with the application process shall be grounds for rejection. If such submission is discovered after entrance into the School or award of a degree, it shall be grounds for dismissal or for revocation of the degree.

The School is a participant in the American Medical College Application Service (AMCAS). Applications for a place in the first-year class can be obtained only from AMCAS, 1776 Massachusetts Avenue, N.W., Suite 301, Washington, D.C. 20036. When completed, this application is returned to AMCAS for distribution to schools selected by the applicant. The AMCAS application deadline is November 15 of the year preceding that for which admission is sought.

After receipt of our copy of the AMCAS application, the Office of Admissions will send the applicant a Supplemental Application. This requests information not included on the AMCAS application. Submission of this supplemental application (due no later than December 31), including the nonrefundable supplemental application fee ($35), will initiate Admissions Committee processing of the application. On the basis of available information, some applicants will be asked to have letters of evaluation (recommendation) sent. After careful review of these documents, the committee will extend an invitation for interview to the most promising candidates. When these steps are completed, the application will be brought to the Admissions Committee for final decision. Applicants will be informed of final decisions immediately. Although it does not assume an obligation to report missing or erroneous credentials, the Admissions Office will try to contact the applicant if it is noted that necessary credentials are missing.

The School also participates in the AMCAS Early Decision Program. Interested applicants should read the AMCAS information booklet included with the AMCAS application materials. Early decision applicants should be aware that (1) they must submit their application by August of the year preceding that for which admission is sought and (2) for consideration this supplemental application and all letters of recommendation and transcripts must be received by the Office of Admissions no later than September 1. Decisions on early decision candidates are usually made by October 1 and no later than October 15.

Applicants should refer to the AMCAS information booklet and to the admissions brochure available from the School of Medicine and Health Sciences Office of Admissions for the most up-to-date information available at the time of application. Details included in those sources supersede information contained in this *Bulletin*.

Application with Advanced Standing

Information and applications for admission with advanced standing should be obtained from the Office of Admissions (M.D. Program), School of Medicine and Health Sciences, 2300 Eye Street, N.W., Washington, D.C. 20037.

Applications may be submitted for either the second or third year. No applicants will be considered for advanced standing who have not completed all requirements for consideration for admission to the first year of study in the School of Medicine and Health Sciences (see Entrance Requirements). All applicants, except those currently enrolled in Doctor of Medicine degree programs at U.S. or Canadian schools, will be required to record scores on each subtest of the Medical Science Knowledge Profile.

All applicants must submit the advanced standing application and $40 application fee by mid-May, three letters of recommendation, and Medical Science Knowledge Profile or National Board of Medical Examiners scores. If accepted, *official transcripts will be required*. The Admissions Committee will request an interview with selected students. Detailed information and guidelines may be obtained from the Office of Admissions in January of the intended year of transfer.

Selection Procedures

To process the vast number of first-year applications to this institution fairly and expeditiously, a screening evaluation system is utilized. This evaluation procedure screens applicants on the basis of undergraduate grades (taking into account improvement in performance in later years), Medical College Admission Test (MCAT) scores, and pertinent extracurricular and work experiences. Some additional consideration is given to applicants from the District of Columbia and the neighboring metropolitan area as well as to applicants from George Washington University. There are no age limits.

Following this initial review approximately 60% of all applicants are asked to submit letters of evaluation, which are reviewed carefully. At the discretion of the Committee on Admissions, about 1,000 applicants are invited to be interviewed.

When all credentials and interview reports are available, the application is reviewed by the Admissions Committee. In this review, although grade-point and MCAT scores are considered, major consideration is given to the essay portion of the applications, the letters of evaluation, and the interview reports, in addition

attempt to assess those motivational and personal characteristics that the committee feels are important in choosing future physicians.

Applicants who are offered a place in the class are required, within two weeks, to notify the Office of Admissions (M.D. Program), School of Medicine and Health Sciences, in writing, of their intent to accept the place reserved. A substantial deposit is required in July and is credited towards the first semester tuition.

Program of Study

The faculty and administration of the School of Medicine and Health Sciences have developed a curriculum designed to prepare each student for a professional life of continuous learning. Because students differ in background, ability, and career interests, the curriculum is balanced with required courses, and students are encouraged to maximize achievement within their own limits. It is presumed that all graduates will seek additional education in graduate training programs before assuming complete responsibility for independent clinical decision making.

In the first year, the student concentrates primarily on basic sciences. The course of study includes anatomy and biochemistry in the first semester. In the second semester, the student concentrates on physiology and microbiology in addition to an integrated course in neurobiology.

Freshman and sophomore medical students are permitted to register for electives for credit or use elective time at their discretion. The first two weeks of an elective are probationary, to enable students to decide whether it is suited to their needs. After completing the first two weeks of an elective, students are committed to complete the course requirements.

The second year integrates basic science and clinical information. Pathology and pharmacology provide the major basic science substrates. This academic program has been evolving since 1970, and several innovations have been introduced each year. The course of study is coordinated by a program director. Integration is accomplished through faculty subcommittees working with the program director and the second-year subcommittee on educational planning. Medical students are introduced to physical diagnosis during the first semester of the second year.

The final two years form a continuum of required clerkships and elective sequences designed to bring the student to optimal readiness for graduate training. Clerkships are required in medicine, surgery, pediatrics, obstetrics and gynecology, psychiatry, and health care sciences. Each student must complete a four-week acting internship in one of the following: medicine, pediatrics, or family medicine. In addition, each student must take two-week clerkships in anesthesiology, emergency medicine, and a nonclinical (didactic) course. Students choose from options in orthopaedics, urology, ophthalmology, pediatric surgery, or otolaryngology. All students must have a clinical course in neurosurgery or neurology.

A variety of elective experience is available at the University and its affiliated hospitals; permission may be granted to take electives elsewhere.

During the entire educational experience, students are encouraged to assume responsibility for their self-assessment and continued learning. It is the goal of the faculty to select and educate concerned human beings who will function productively and effectively during a long career in medicine.

Honors

Candidates who have completed the four-year course for the Doctor of Medicine degree and have received 50% or more of the grade of *H* (Honors) in required courses may be recommended by the Executive Committee of the Medical Center for graduation "With Distinction."

Combined Degree Programs

Combined Bachelor of Arts and Doctor of Medicine

To be recommended for the degree of Bachelor of Arts, the candidate must complete at least 94 semester hours of prescribed college work (at least 30 hours and one year of residence must be completed in Columbian College of Arts and Sciences) and the first year of the medical curriculum. Upon satisfactory completion of the fourth year of the medical curriculum the student becomes eligible for the degree of Doctor of Medicine.

It should be understood, however, that admission to Columbian College does not guarantee admission to the School of Medicine and Health Sciences.

Combined Master of Science and Doctor of Medicine

The departments of the School of Medicine and Health Sciences cooperate with the Graduate School of Arts and Sciences in offering programs leading to the combined degrees of Master of Science and Doctor of Medicine in the fields of biochemistry, genetics, microbiology, mycology, pharmacology, and physiology.

Students in the School of Medicine and Health Sciences who wish to apply for the combined degrees of Master of Science and Doctor of Medicine must meet the requirements for admission to the Graduate School of Arts and Sciences. They must be recommended by the chairman of the department and by the Dean of the Graduate School of Arts and Sciences and the Dean for Academic Affairs of the Medical Center.

The Master of Science degree program consists of a minimum of 30 semester hours, which includes a thesis (equivalent to six semester hours). For a Master of Science degree program that does ***not*** include a thesis, the number of semester hours of graduate course work is determined by the department. The program without the thesis is not an individual student option and is not available in every department.

A maximum of 12 semester hours of credit for graduate-level courses ***completed as a part of the Doctor of Medicine degree*** (and not already applied toward the bachelor's degree) will be allowed in fulfillment of the requirements of the Master of Science degree. The remaining semester hours of work, including a thesis if it is required, must be in course work in the basic medical sciences normally required for a Master of Science degree in the Graduate School of Arts and Sciences.

Dual Program for the Doctor of Medicine and Doctor of Philosophy Degrees

In cooperation with the Graduate School of Arts and Sciences, a dual program is available to qualified students who seek both the Doctor of Medicine and

Doctor of Philosophy degrees. The requirements that must be fulfilled for both degrees are identical to those currently and separately established in the School of Medicine and Health Sciences and the Graduate School of Arts and Sciences.

To enter the dual-degree program, a prospective student first must apply for and gain admission to both the Graduate School of Arts and Sciences and the School of Medicine and Health Sciences separately through established procedures. On admission to both schools, the student may apply for affiliation with the dual-degree program. Work toward the Doctor of Philosophy degree is performed under the jurisdiction of a departmental doctoral committee and is available in more than 50 research fields.

A student working toward these degrees may apply a maximum of 24 semester hours of approved work taken in the M.D. degree program of the School of Medicine and Health Sciences toward the total of 72 semester hours required for the Doctor of Philosophy degree. Twenty-four hours must be earned in graduate courses during periods when the student is not obligated to full-time enrollment in the M.D. degree program, that is, during summer sessions, vacation periods, etc. The final 24 semester hours of dissertation research toward the Doctor of Philosophy degree may begin concurrently with the final semester of graduate course work. The estimated time for completion of this dual program is six years.

Master of Science and Doctor of Philosophy Requirements

The detailed requirements for the degrees of Master of Science and Doctor of Philosophy are stated in the *Undergraduate and Graduate Programs Bulletin* of the University, which is available at the Graduate School of Arts and Sciences, George Washington University, Washington, D.C. 20052.

Regulations for M.D. Candidates

General

Using the guidelines below, the Educational Planning Committee will periodically determine and report to the Faculty Senate on the appropriateness and number of credits for all courses.

First- and Second-Year Courses:

Lecture Courses—one semester hour for each hour of lecture time per week per semester, adjusted as appropriate

Laboratory Courses—one semester hour for each two or three hours of laboratory time per week per semester, adjusted if appropriate

Third- and Fourth-Year Courses:

Clinical Courses—five semester hours for each four weeks for clerkship; three semester hours for two-week clerkships.

The minimum academic requirement for the M.D. degree will be the completion of all courses designated by the Faculty Senate to be required and a passing grade in all courses taken, whether required or not, other than electives in the first and second years.

Evaluation of Academic Performance

Faculty are responsible for evaluating the performance of students in a meaningful, useful, and timely manner. A preclinical evaluation form will be used in all first- and second-year courses. This form will be prepared in triplicate at the end of each course and distributed as follows: one copy to the Dean for Academic Affairs, to be included in the student's file; one copy to the department; and one copy to the student. A clinical evaluation form will be used in all third- and fourth-year courses. This form will be prepared in triplicate at the end of each clerkship or elective and distributed as follows: one copy to the Dean for Academic Affairs, to be included in the student's file; one copy to the department; and one to the student. This form shall (a) list the attribute being evaluated; (b) provide for indication of the quality of performance; and (c) provide space for written comments, which are required. Each department offering required courses should designate an evaluation coordinator to be in charge of student evaluation.

Grades

The authority for the assignment of grades rests primarily with academic departments or with interdisciplinary faculty. Exceptions are grades of Incomplete and Withdrawal (see below), which may be assigned only for reasons acceptable to the Dean for Academic Affairs. Departments are responsible for the assignment of grades on a rational, just, and unbiased basis.

The grading system for all non-required electives will be Pass (*P*)/Fail (*F*). For all required courses and senior electives, the grading system will be Honors (*H*), Pass (*P*), Fail (*F*), Conditional (*CN*), In Progress (*IP*), Incomplete (*I*), Withdrawal (*W*), and Exempt (*X*).

The following definitions apply:

Honors (H)—Those students whose performance in a subject is determined by the concerned department to be of superior quality and who, in addition, have demonstrated at the highest level those qualities of intellectual curiosity, motivation, and self-discipline, which clearly set them apart from the majority of the group, may be assigned the grade of Honors (*H*).

Pass (P)—All students, with the exception of those defined above, whose performance in a subject at least meets the requirements established by the concerned department shall be assigned a grade of Pass (*P*).

Fail (F)—Those students whose performance in a subject clearly falls so far below departmental passing standards that limited remedial work would be inadequate to correct the deficiencies shall be given a grade of Fail (*F*).

Conditional (CN)—Those students who do not meet the minimum requirements established by the concerned department but who could reasonably be expected to do so through a limited program of remedial work, developed by the department and approved by the Committee on Educational Evaluation, shall be assigned the grade of Conditional (*CN*).

In Progress (IP)—The notation of *IP* will be assigned to students in courses that require more than one semester for completion. A grade will be assigned upon completion of the entire course in a subsequent semester.

Incomplete (I)—The notation of *I* will be assigned when a student fails to complete all the required work in a course for reasons acceptable to the Dean for Academic Affairs. Assignment of Incomplete requires the prior approval of the Dean for Academic Affairs, or his or her designee, on a case-by-case basis. A student in the first and second year may not proceed into the work of the

following year until a grade of *I* has been removed; if not removed, a grade of *I* will be changed automatically to a grade of *F* after one year. A student in the third or fourth year must remove a grade of *I* prior to graduation.

Withdrawal (W)—The notation of *W* will be assigned only when a student is unable to continue in the course for reasons acceptable to the Dean for Academic Affairs. Such reasons may not include scholarship.

Exempt (X)—The notation of *X* will be assigned when a student is excused by a department from taking a required course on the basis that he or she is already proven competent in the subject or when a student is given credit for passing an equivalent course at another institution.

All departments should submit *F* and *CN* grades to the Office of the Dean for Academic Affairs as soon as possible after the completion of a course or clerkship.

A grade of *F* requires that the student repeat the course or an equivalent remedial experience at this or some other institution, approved by the department and the Dean for Academic Affairs, prior to proceeding to the work of the following year. Upon completion of the requisite course with a grade of Pass (*P*) or its equivalent, the student shall be permitted to continue in the M.D. program and the grade of *F* will be converted to *F/P* if the passing grade was given by our faculty or *F/X* if the course was taken at another institution. The grade of *CN* is not a passing grade and must be upgraded prior to the beginning of the next academic year or, in the case of clinical subjects, prior to graduation. Upon certification by the department that the student has attained suitable proficiency in the subject, the student shall be permitted to continue in the M.D. program and the grade of *CN* will be converted to *CN/P*. A student may, in lieu of such a program, elect to repeat the course at this or any other institution that is approved by the concerned department. A grade of Pass (*P*) or better shall then result in conversion of the *CN* to *CN/X*. Failure to upgrade a *CN* to *CN/P* or *CN/X* by one of these procedures within the prescribed period shall result in automatic conversion of the *CN* to *CN/F*.

As soon as possible after receipt of grades, the Dean for Academic Affairs will inform the Committee on Educational Evaluation of the names of all students receiving grades of *F* or *CN* and submit their records to the committee for evaluation and recommendations. (The process defined below is designed to provide that protection against improper academic evaluation guaranteed by Section 2 B of the Statement of Student Rights and Responsibilities.)

If a student feels an evaluation or grade to be unjust or inaccurate, he or she may, within five days of receiving the grade, appeal to the signer of the evaluation for a hearing, simultaneously notifying the chairman of the department. The signer of the evaluation must respond to the student quickly. Failure of the student to initiate such an appeal within five days indicates acceptance of the grade, unless an extension of the time limit is indicated for extenuating circumstances acceptable to the Associate Dean for Student Affairs. From this point on, the Associate Dean for Student Affairs will monitor the process to assure that it moves forward in a timely manner.

If the student remains dissatisfied, he or she should appeal in writing to the chairman of the department or clinical division promptly for reconsideration of the evaluation. The chairman shall conduct a review, consulting as appropriate with other faculty and staff, and inform the student in writing of the chairman's determination at the earliest possible time. If the student remains dissatisfied, he or she may appeal in writing to the Associate Dean for Student Affairs. The Associate Dean, or his or her designee, will attempt to

arbitrate by conferring with the student and authorities within the depar ment. Should that fail to resolve the complaint, the Associate Dean wi establish an *ad hoc* committee to review the complaint. The committee wi consist of four persons, as least one of whom will be a student, and none of th committee members will be from the department against which a complai has been registered. The task of the committee will be to advise the Associat Dean for Student Affairs about (1) whether or not the evaluation or gradi procedures used in that particular case were essentially the same as those use for other students in that course and (2) whether or not there is sufficien evidence of an unjust or erroneous evaluation to warrant referral of the cas back to the Department for reassessment of the student's competence. Actio upon the committee's advice, the Associate Dean will either accept the origin grade and/or evaluation as valid or refer the case back to the department fo reevaluation and/or grading of the student.

The Associate Dean in cooperation with the department chairman wi determine an appropriate procedure for reevaluation and/or grading of th student. If the student or faculty member chooses to contest further the join decision of the chairman and Associate Dean, or if these two administrators are unable to reach agreement, the Dean for Academic Affairs will review the situation and render a final decision on a reevaluation process. In every case authority to evaluate and grade students resides in the academic department.

Academic Dismissal

The Dean for Academic Affairs may dismiss a student for academic reasons on recommendation of the Committee on Educational Evaluation. The Committee on Educational Evaluation will make its recommendations to the Dean for Academic Affairs after careful review, considering the total number of semester hours of *CN* and *F* grades in courses and electives (except first- and second-year electives) attained by the student during the M.D. program. Conditional grades that have been remedied to *CN*/*P* and failing grades that have been remedied are calculated as conditional and failing grades, except in the case of a student who has been permitted to repeat a semester or a year. In such cases the initial grades will not be counted for possible dismissal.

The following regulations establish the conditions under which Academic Dismissal may be recommended.

> A student (a) who received grades of *F* in required courses totaling 14 or more semester hours in any academic year, or (b) who received grades of *CN* and *F* in required courses totaling more than 20 semester hours of work in any academic year, or (c) who received grades of *F* in more than 20 semester hours of required work in the M.D. program, or (d) who received grades of *CN* and *F* totaling more than 30 semester hours of required work in the M.D. program, or (e) who fails to meet any special requirements previously specified for that student by the Dean for Academic Affairs as condition for continuation in the program, or (f) whose knowledge, competencies, and personal characteristics have not achieved, in the judgment of the Committee on Educational Evaluation and the Dean for Academic Affairs, a satisfactory level of development and integration at any stage of training to justify continuing him or her as a reasonable candidate for the M.D. Degree (see also Evaluation of Professional Comportment, below) will be subject to dismissal from the M.D. degree program.

Irregular Progress

Repetition of a Year

Upon the advice of the Educational Evaluation Committee, the Dean for Academic Affairs may require that a student in academic difficulty repeat a year or may permit a student at risk for dismissal to repeat a year. Requiring repetition of a year would be an option when there was a pattern of academic problems that would be difficult or impossible to remedy before the beginning of the next academic year. Allowing a student to recycle would be an option when the student was subject to dismissal on academic grounds but showed promise of mastering academic material on an additional attempt and proceeding without further major difficulty toward becoming a competent physician.

A student eligible for promotion may be allowed to repeat a year at his or her own request.

Leaves of Absence

Leaves of absence may be granted at the discretion of the Associate Dean for Student Affairs.

Withdrawal from the M.D. Program

Withdrawal from the M.D. program is anticipated by the administration to be permanent. In the event that a student later changes his or her mind and wishes to reenter the program, he or she must reapply through the Admissions Committee as any other candidate for medical school.

Evaluation of Professional Comportment

This policy has been reviewed by the University Board of Trustees and established to accommodate the unique curriculum and degree requirements of the Medical Center. Unless the University Provost decides in a particular case to have the case processed under the University Guide to Student Rights and Responsibilities, all cases involving misconduct by M.D. candidates will be processed under the following regulations.

Occasionally, by his or her behavior or pattern of behaviors, a student may raise concern as to his or her suitability to continue in the study of medicine. It is impossible to catalogue all behaviors that might raise serious questions about a student's competence to continue in medical school. The process described below has been adopted by the Faculty Senate. It is intended to deal with behaviors that may be unacceptable or dangerous to the public if carried into the practice of medicine.

The following steps will be the process for identifying and dealing with students with serious problems relating to professional comportment:

When a problem is perceived, the observer will communicate with the Associate Dean for Student Affairs. If the communication is verbal it must be confirmed immediately by a signed letter, which will be placed in the student's confidential file, located in the Academic Dean's office. Access is restricted to the student under consideration, the Dean for Academic Affairs, and the Associate/Assistant Deans for Student Affairs and for Education or their designees and, where appropriate, the Subcommittee on Professional Comport-

ment of the Educational Evaluation Committee. This file will be maintained until the student is awarded the M.D. degree or until he or she withdraws, transfers, or is dismissed from the University for academic reasons. This file and its contents will be destroyed unless the Committee on Educational Evaluation has acted to make it part of the student's permanent record. In any case in which a student is dismissed from the University for nonacademic reasons, the contents of the file will be preserved permanently as a part of the student's record. This process may be initiated by the Committee on Educational Evaluation when it is suspected that academic deficiencies are the result of psychological, medical, or behavioral problems.

The Associate Dean for Student Affairs (or his or her designee) must meet with the student as soon as possible. Options for the Associate Dean would include (but not be limited to) the following:

1. Advising the medical student but taking no further action.
2. Recommending that the student seek professional assistance for personal problems that may be impairing professional performance.
3. Developing additional information through contacts with the student, his or her peers, faculty, or professional consultants. For example, the Associate Dean may, with the student's concurrence, refer the student for medical or psychological evaluation. The charge for such an evaluation would be paid by the School of Medicine and Health Sciences, and the professional consultant would be requested to make a written report for inclusion in the student's confidential file.
4. Referring the case to the Subcommittee on Professional Comportment. This subcommittee will consist of two students from the third or fourth year of the M.D. degree program and two full-time faculty, at least one of whom shall be a member of the Educational Evaluation Committee. No administrative officer, including departmental chairmen, course coordinators, or residency training program directors, will be eligible to serve on this subcommittee. Appointment will be for a term of one year. Tenure on the subcommittee will not exceed three years. The subcommittee members and its chairman will be named by the Chairman of the Educational Evaluation Committee. Students will be chosen from three third-year and three fourth-year students nominated by the Student Council, the others to be retained as possible alternates. All members of the subcommittee will have voting privileges, and decisions will be made by majority vote with all four members being present. Minutes of the subcommittee will be kept in the student's confidential file. The chairman may keep duplicate records for the duration of the review, but these are to be returned to the Dean's Office at the end of the process.

If the subcommittee is sent a case for review, it will be responsible for gathering information from individuals who may include (but not be limited to) the student in question, his or her peers, faculty, the administration of the medical school, and where deemed appropriate, professional consultants on medical or psychological aspects of the problem. Meetings of the subcommittee are confidential, but the student in question and/or his or her counsel may attend information-gathering sessions as observers.

If the professional evaluation is requested by the subcommittee, referrals will be made by the Associate Dean for Student Affairs, or his or her designee. As described above, the cost of this evaluation would be borne by the School of Medicine and Health Sciences and a written report requested for inclusion in the student's confidential file. In contrast, a recommendation for the student to seek professional assistance would remain the concern of the student and not of the School of Medicine and Health Sciences. No contacts by the School would be made to that professional, and the expense will be borne by the student.

The subcommittee will make a disposition regarding each case referred to it as soon as possible. Possible dispositions would include (but not be limited to

advising the student, referring the student for professional assistance for any medical or psychological problem at his or her expense, recommending modification in the student's academic program, and recommending temporary suspension or permanent dismissal from the M.D. program. Any recommendation for modification in the academic program requires that the case be reviewed by the parent committee. The student and, if he or she wishes, the student's counsel may be present during the presentation of information at such a review.

The subcommittee and/or the parent committee will submit recommendations to the Dean for Academic Affairs, or his or her designee.

Right of appeal will be as follows: The student will be informed of his or her right to request review by the next higher authority, that is, the Subcommittee on Professional Comportment, the Educational Evaluation Committee, the Dean for Academic Affairs, and finally, the Vice President for Medical Affairs.

Academic Dishonesty

This policy has been reviewed by the University Board of Trustees and established to accommodate the organizational and committee structure of the Medical Center. In cases of academic dishonesty involving M.D. candidates that may arise from within the Medical Center, this policy will be used instead of the University Policy on Academic Dishonesty adopted August 8, 1977.

The Medical Center community, in order to fulfill its purpose, must assure integrity of behavior in the academic enterprise, establishing and maintaining guidelines as necessary to do so. All members of the community are expected to exhibit honesty in their academic work. Medical students are assumed to be familiar with commonly understood principles of academic honesty and with such examples of dishonest behavior as copying answers on examinations, using unauthorized aids to memory in examinations, plagiarizing, presenting papers that were purchased or otherwise acquired as being of one's own authorship, and falsifying clinical or research data. They have a special responsibility to learn and observe any special procedures established within the Medical Center to assure integrity of academic behavior. Failure to act in accordance with such procedures will be considered academic dishonesty.

All members of the community—students, faculty, and staff—have a responsibility to prevent acts of academic dishonesty or, if they have occurred, to note and act upon them and to keep them from recurring.

Procedures

The remainder of this statement aims solely at informing members of the medical community of their rights and responsibilities with respect to academic dishonesty.

Reports of incidents of academic dishonesty that come to the attention of faculty members, Medical Center staff, or students are to be made by completion of the form "Charge of Academic Dishonesty," after consultation with the departmental chairman, course coordinator, or director of the service, as appropriate. This form, which identifies the student, describes the nature of the charge, and includes supporting evidence, should be forwarded to the Dean for Academic Affairs and should remain confidential.

Upon receipt of the form, the Dean for Academic Affairs will meet with the student to discuss the charge and supporting evidence and to present the

student with a copy of the charge and with a copy of the "Regulations for M.
Candidates."

If the accusor, the student, and the Dean for Academic Affairs agree on the accuracy of the charges, the fact of this agreement shall be noted by the signatures of all three parties on the form, and the case will be referred directly to the Educational Evaluation Committee for recommendation appropriate sanctions and modification of the academic program if necessar

If the student or the Dean believes the charge(s) not to be accurate, the case will be referred to the Educational Evaluation Committee for review by the Subcommittee on Professional Comportment. The proceedings of the Subcommittee and/or the parent committee shall be conducted as previously described in these regulations.

Sanctions

In addition to any other disposition available under Evaluation of Professional Comportment, one or more of the following sanctions must be invoked by the Dean for Academic Affairs after considering the recommendation of the Educational Evaluation Committee.

1. Discarding the work product, which might result in an Incomplete, with the requirement that the student satisfactorily complete compensatory work or be reevaluated on relevant material.
2. A notation of "Dropped from the course for academic dishonesty" placed on the transcript, to be expunged one year after imposition of the penalty or upon graduation, whichever occurs first. Such a notation will not contribute to jeopardy for academic dismissal but would require repetition of the course if the course is required.
3. A notation of "Dropped from the course for academic dishonesty" placed on the transcript, with the notation appearing permanently on the record. Such a notation will not contribute to jeopardy for academic dismissal but would require repetition of the course if the course is required.
4. Expulsion of the student from the School of Medicine, with the notation of "Academic Dishonesty" placed on the permanent record.

Safeguards During Procedure

Should the review and any appeal procedures not be completed before the date on which grades are submitted by the department, the grade of Incomplete will be recorded for the student in that course until the charges have been fully adjudicated. The student will not be prevented from meeting other academic requirements—such as taking Part 1 of the National Boards Examination or entering into the matching—prior to the imposition of sanctions and completion of all appeals that are to be undertaken. If the student voluntarily withdraws from the institution prior to completion of the review process, the following notation will be placed on his or her transcript: "Withdrew following accusation of academic dishonesty prior to completion of review and determination."

Supplemental Guidelines

All departmental chairmen and course and clerkship coordinators are responsible for informing faculty and staff members about the foregoing statement

Chairmen are also responsible for publicizing to their students, faculty, and staff any supplemental departmental guidelines for academic honesty appropriate to their discipline.

Policy on Promotions and Graduation—Academic Requirements

In general, promotion from one year to another—and recommendation to the Faculty Senate for award of the M.D. degree—will be automatic upon achievement of academic requirements. Under exceptional circumstances, when evaluation of personal comportment is pending or completed under procedures described in Evaluation of Professional Comportment, promotion or graduation may be postponed, denied, or subject to additional requirements set for individual students by the Dean for Academic Affairs.

Specific Requirements

Year 1 to Year 2—Successful completion of all required work of the first year, with performance at least at the passing level (see p. 29). The student may not begin the work of the second year until all deficiencies of the first year—that is, failing or conditional grades in required courses—have been satisfactorily remedied.

Year 2 to Year 3—Successful completion of all required work of the second year, with performance at least at the passing level (see p. 29). In addition, receipt in the Dean's office of scores on Part 1 on the National Board of Medical Examiners examination. The student may not proceed with the work of the third year until all deficiencies in work of the second year have been satisfactorily remedied.

Year 3 to Year 4—Successful completion of all required clerkships of the third year with performance at least at the passing level (see p. 29). A student may be permitted to matriculate in the fourth year despite unremedied deficiencies in the third year performance if those deficiencies are to be remedied prior to graduation during time that would otherwise be available to the student as elective time or vacation.

Eligibility for Graduation—Students will be recommended to the Faculty Senate to be awarded the M.D. degree upon completion of the minimum academic requirements described on page 29 (completion of all courses designated by the Faculty Senate to be required and a passing grade in all courses taken, whether required or not, other than electives in the first and second years) and fulfillment of any additional conditions relating to personal comportment imposed by the Dean for Academic Affairs (see Evaluation of Professional Comportment, p. 33).

Application for Graduation

Application for graduation must be filed in the office of the Dean for Academic Affairs at the time of registration for the last semester of the fourth year.

Presence at Graduation

A candidate is required to be present at the graduation exercise unless written application for graduation *in absentia* is approved by the Dean for Academic Affairs.

Fees and Financial Regulations for M.D. Candidates

The following fees have been established for the 1985–86 academic year.*

Application fee	$ 40
Tuition fee, for the academic year	18,500
University Center fee, charged all students (except those granted leave of absence status) each semester	82
Late-registration fee, for failure to register within the designated period:	
During first week of classes	25
During second and third weeks of classes	50
After third week of classes (if permitted)	100
Late payment fee, charged for failure to make payments when due (see *Payment of Fees*, below)	15
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see *Payment of Fees*, below)	35
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any other reason	15
Transcript fee	2
If two or more transcripts are requested at the same time, fee for the first two copies is $2 each, fee for each additional copy	3
Replacement of lost or stolen picture identification card	2

Payment of Fees

The annual tuition fee for the academic year is payable in two equal installments on or before registration day for each semester. M.D. students who register during the summer for courses offered in other divisions of the University will be charged the regular summer tuition and other fees. No student is permitted to complete registration or attend classes until all charges are paid or until arrangements for payment have been made. Tuition and fees are payable at the Office of the Cashier of the University. Checks should be made payable to George Washington University, with student identification number shown in the upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. Tuition is due and payable in full as described above, but students may sign a deferred payment contract with the Student Accounts Office at the time of registration permitting them to pay one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the eighth week of classes for the fall and spring semesters. Interest at the rate of 8% per annum on the unpaid balance will be charged from the date of registration to the date payment is made. A 10-month payment plan is also available. Tuition is paid in 10 equal installments, beginning in May and ending in February. There are no fees or finance charges associated with this plan for students choosing to use it. Students who would like more information should contact Student Accounts, 801 22nd Street, N.W., Washington, D.C. 20052, (202)676-7350.

*For courses offered in other divisions of the University, the following 1985 Summer Sessions fees apply for each semester hour: Tuition $223; University Center fee, $7.75.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $1,500 or more per semester. Under such circumstances the student may be permitted to pay one-half of that amount at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a late payment fee and will be subject to the interest charge of 8% per annum. Accounts that become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of the deferred payment contract in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due the University in addition to a financial reinstatement fee of $35.

After entering the course of instruction the student is obligated for the tuition for the full semester.

Acceptance by the University of a student's fees does not in any way obligate the School of Medicine and Health Sciences to accept the student for any subsequent semester or summer session, and the right is reserved to require the withdrawal of any student whenever, in the interest of the student or the School, the Executive Committee of the Medical Center deems it advisable to do so.

Cost of Textbooks and Student Equipment

It is estimated that the minimum cost of necessary textbooks and student equipment (microscope, drawing materials, glass slides, clinical thermometer, stethoscope, hemocytometer, uniforms, etc.) is approximately as follows: first year, $900; second year, $650; third year, $400; and fourth year, $400. Microscopes must be provided by the student. Rentals are not available from the School.

Prepaid and Deferred Payment Plans

Several commercial programs for those who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs, but will be happy to provide guidance to students and parents.

Withdrawals and Refunds

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the dean. Notification to an instructor is not an acceptable notice.

In authorized withdrawals from the University, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

Withdrawal dated on or before Friday of the first week of classes	90%
Withdrawal dated on or before Friday of the third week of classes	75%
Withdrawal dated on or before Friday of the fifth week of classes	50%
Withdrawal dated after the fifth week of classes	none

Regulations governing student withdrawals as they relate to apartment and food service charges are contained in the specific lease arrangements.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be reduced or refunded because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

Financial Aid

University policy and federal law require that all students receiving financial assistance from institutional and federal sources maintain satisfactory academic progress, the definition of which is contained in Regulations for M.D. Candidates, page 29. How the regulations are applied to student eligibility for aid is described here.

Satisfactory Academic Progress

The Regulations for M.D. Candidates state that "The minimum academic requirement for the M.D. degree will be the completion of all courses designated by the Faculty Senate to be required, and a passing grade in all courses taken, whether required or not, other than electives in the first and second years." These requirements are considered to be rigorous and demanding. As a result, the progress of each student working toward an M.D. degree at the George Washington University School of Medicine and Health Sciences is scrupulously monitored.

As a rule, the course work described by the Regulations is completed in four academic years of full-time study. In addressing the issues of irregular progress, however, the total time for completion of the M.D. degree may be longer. The Regulations provide that "Upon the advice of the Educational Evaluation Committee, the Dean for Academic Affairs may **require** that a student in academic difficulty repeat a year; or may **permit** a student at risk for dismissal to repeat a year. Requiring repetition of a year would be an option when there was a pattern of academic problems that would be difficult or impossible to remedy before the beginning of the next academic year. Allowing a student to recycle would be an option when the student was subject to

dismissal on academic grounds but showed promise of mastering academic material on an additional attempt and proceeding without further major difficulty toward becoming a competent physician." In other words, students making irregular progress are nonetheless considered to be making satisfactory academic progress, even though the years toward completion of the degree may exceed the typical four. The Regulations do not specify the maximum number of years in which the degree may be obtained.

Financial Aid Eligibility

The criteria for receipt of financial aid funds from School and government sources are detailed in the *Financial Aid Memo*, which is the Financial Aid Office's annual policy and procedures statement. In brief, the primary basis for awarding student assistance is demonstrated need, as determined by federally accepted methodologies for ascertaining family financial strength. Each recipient must be enrolled and actively taking courses. In addition, recipients must maintain satisfactory academic progress in accordance with Regulations for M.D. Candidates.

Standards of Progress—

1) A student who successfully completes required course work within the academic year and moves on to the next year's set of requirements meets the satisfactory academic progress criterion for financial aid eligibility and has four consecutive academic years in which he or she may be eligible to receive financial aid. A student who is having academic difficulty within an academic year but is able to complete necessary remediation before the beginning of the next academic year is also eligible to receive financial aid for four consecutive academic years.

2) A student may require additional time to complete course work due to academic or personal difficulties. In such situations, the Educational Evaluation Committee and the Associate Dean for Student Affairs may establish a schedule for the student that departs from the norm and may require repeating a year of study. For such students, the maximum time frame for financial eligibility shall be seven (not necessarily consecutive) years.

3) A student may be granted a leave of absence for a variety of reasons acceptable to the Associate Dean for Student Affairs. The period of time for which the student has been approved leave shall be excluded from the maximum established time frame. Students are ineligible for financial aid funds while on leave of absence.

4) Students who are taking courses offered by the School of Medicine and Health Sciences but who are registered through the Division of University Students are not eligible for financial aid funds through the School of Medicine and Health Sciences. In these cases, the University Office of Student Financial Aid determines financial aid eligibility requirements.

Qualitative Assessment—The Associate Dean for Student Affairs will monitor the progress of each student at the conclusion of each academic year to determine whether or not the student is making sufficient progress towards completing the degree within the maximum established time frame. The assessment of performance of each student in all courses will be reviewed. This may be an indication of honors, pass, conditional or fail grades, or another form of evaluation. Any student who receives even a single grade below the passing level is referred for review to the Educational Evaluation Committee, and a remedial program is recommended.

Documentation—Certification of the satisfactory academic progress of each student receiving financial assistance will be provided to the Financial Aid Office by the Associate Dean for Student Affairs for the student's permanent file.

Appeals—The Dean for Academic Affairs will be responsible for hearing appeals regarding satisfactory academic progress and its effect on financial aid eligibility. The Financial Aid Office will accept the decisions of the Dean for Academic Affairs.

Publication of Policies—The *Financial Aid Memo*, which is published yearly, contains all the School's policies regarding student eligibility for financial aid. The *Memo* is reviewed annually by the Financial Aid Advisory Committee and is distributed to all medical students (accepted as well as enrolled) requesting financial assistance.

GW Student Assistance Funds

The following scholarships and loans are available to Doctor of Medicine degree candidates and are awarded on the basis of financial need unless otherwise specified. To apply, students must complete the application package for GW assistance funds on an annual basis. The forms are available upon request to accepted or currently enrolled students from the Financial Aid Office of the Medical Center. The deadline for submission is April 15.

Scholarships

Scholarships from University funds are offered to full-time students in the M.D. program on the basis of financial need unless otherwise specified. These awards are made for one academic year at a time and are credited directly to the student's tuition bill.

Achievement Rewards for College Scientists (ARCS) Foundation, Inc. Scholarship—Awarded to a student on the basis of financial need and superior grades. Candidates must be citizens of the United States.

Anna Bartsch Hospital Intern Scholarship (1946)—A partial scholarship established by Dr. Anna Bartsch-Dunne as a memorial to her mother. Awarded to a woman intern in the University Hospital.

Dr. Edith SeVille Coale Scholarships (1965)—Provided at the request of Dr. Coale for women in the School of Medicine and Health Sciences. The scholarships are administered by the Zonta Club of Washington. Application should be made to the Financial Aid Office of the Medical Center no later than December 1.

Joseph Collins Foundation Scholarships (1951)—Available to medical students upon application through the Financial Aid Office of the Medical Center.

Joan Luria Hines Scholarship (1968)—Established by friends, students and faculty of the School of Medicine and Health Sciences as a memorial to the wife of a medical student.

The Garfield Kass Memorial Medical Scholarship (1979)—Established by his wife, Rose. Awarded on the basis of financial need to a worthy student in the School of Medicine and Health Sciences.

Ki-Wives of Washington Scholarship Fund (1958)—Three scholarships available to students in the School of Medicine and Health Sciences.

Sidney A. Levine Scholarship Fund (1971)—Established to assist medical students on the basis of financial need and academic performance.

Medical Student Summer Research Scholarships—For student participation in the research programs of the School of Medicine and Health Sciences or special training in research methods. Research scholarships are ordinarily awarded for full-time activity during the summer months. Scholars are matched with members of the faculty according to their mutual interests. These programs have been sponsored by the W. T. Gill Foundation.

Thomas M. Peery Scholarship (1974)—Awarded on the basis of financial need to a worthy student in the School of Medicine and Health Sciences.

Dan Pollin Medical Scholarship Fund (1980)—Awarded on the basis of financial need to a worthy student in the School of Medicine and Health Sciences.

School of Medicine Scholarship Fund (1968)—Established by gifts of various and anonymous donors to assist medical students.

Gordon Fay Willey Scholarship (1974)—Awarded to students whose parents are U.S. citizens who are or were enlisted personnel, noncommissioned officers, and officers below the grade of Major in the Army or Air Force or Captain in the Navy of the United States.

Winslow Foundation Scholarship (1974)—Available to medical students who are residents of Maryland, the District of Columbia, or North Carolina, on the basis of financial need.

School of Medicine and Health Sciences Scholarship Fund

Scholarship aid is awarded from income on endowments that have been established by gifts from various donors for tuition awards to students in the School of Medicine and Health Sciences. These awards are distributed on the basis of financial need. These scholarships are made for one year at a time and are credited directly to the student's tuition bill. Listed below are the endowments that support the School of Medicine Scholarship Fund.

Anna Bartsch Scholarship Fund (1946)—Established by Dr. Anna Bartsch-Dunne as a memorial to her mother. Awarded to a woman in the School of Medicine and Health Sciences "of outstanding scholarship, character, and promise, who intends to make the practice of medicine her life profession."

Jack I. Bender Scholarship Fund (1967)—Established by the family of Jack I. Bender as a memorial to their father. Awarded annually to a student on the basis of academic performance and financial need.

Everett Lamont Bradley Scholarship Fund (1954)—By bequest of Alice R. H. Bradley in memory of her son, for a student in the School of Medicine and Health Sciences.

Elma B. Carr Scholarship Fund (1976)—Created from income distribution of the Elma B. Carr, M.D., Trust, the income to be used for scholarships in the School of Medicine and Health Sciences.

Oliver C. Cox Scholarship Fund (1973)—Established in memory of Dr. Oliver C. Cox, "for the establishment, support and maintenance of endowed scholarships in medicine."

Morris H. and Pauline L. Goldenberg Scholarship Fund (1979)—Created by gift of Dr. Morris H. Goldenberg (class of 1929) and Mrs. Pauline L. Goldenberg in memoriam for father and mother, the income from which will be used for needy and deserving medical students in the School of Medicine and Health Sciences. Preference will be given to students expressing an interest in the study of radiology.

Albert A. and Esther C. Jones Scholarship Fund (1981)—To be used to defray expenses, including tuition, room and board, and books of worthy students for the teaching of science or medicine.

Barbara Logan, M.D., Scholarship Fund (1980)—Awarded annually to the third-year student who ranked among the top five students in the class during the first two years and who was experiencing the greatest financial need among those five.

Loughran Medical Scholarship (1976)—A partial scholarship established by the Mary and Daniel Loughran Foundation, Inc., for residents of the Washington metropolitan area. Such residency must have been established prior to the commencement of the recipient's undergraduate studies. Awarded 1978–79 and every third year thereafter.

Medical School Student Financial Assistance Fund (1981)—Established by gifts from various donors to assist needy and deserving students.

David Perry Steinman Memorial Scholarship Fund (1960)—Established by friends and classmates. Awarded annually to a second-year student in the School of Medicine and Health Sciences on the basis of financial need and academic performance.

James J. Whisman Scholarship Fund (1966)—By bequest of James J. Whisman for needy and deserving students in the School of Medicine and Health Sciences.

Columbian Women Scholarship Funds

The Columbian Women Scholarships are awarded to women students on the basis of financial need and scholastic attainment. Candidates must have completed a minimum of 15 hours at this University with a minimum *B* (3.0) average, or the equivalent. A letter of application for these scholarships should be addressed to the Chairman, Columbian Women Scholarships, care of the Alumni Office, George Washington University, Washington, D.C. 20052, no later than May 15 for the fall semester and January 1 for the spring semester. Scholarship aid is awarded from income of the following endowments:

Estelle M. Corbett Scholarship Fund (1973)—Created by gift of Elma Williams for tuition aid for a medical student.

Jessie Fant Evans Scholarship Fund (1967)—Established by bequest of Jessie Fant Evans, former Trustee of the University, for tuition aid.

Lewes D. and Myrtle H. Wilson Memorial Scholarship Fund (1926)—Established by Elizabeth Wilson, as a memorial to her parents, for tuition aid.

Loan Funds

Allied Health Students Loan Fund (1977)—Created by the proceeds from the annual Medical School Follies, to be loaned to students.

A.M.A. Medical School Loan Fund (1964)—Created by the American Medical Association, to be loaned to students.

Doreen and Donald Brown Loan Fund—This fund has been established to provide aid to worthy and needy medical students.

Morris and Gwendolyn Cafritz Foundation Loan Fund for Medical Students (1977)—Created by the Morris and Gwendolyn Cafritz Foundation, to be loaned to students.

Carr Loan Fund (1962)—Created by Edith K. Carr, to be loaned to students.

Carroll Memorial Loan Fund (1981)—Created in memory of Dr. James Carroll and George S. H. Carroll, husband and son of Mrs. Marie W. Carroll.

Abraham I. Gimble Medical School Loan Fund (1977)—Created by gift of Dr. Abraham I. Gimble, to be loaned to deserving and needy students.

Katharine Graham Medical School Loan Fund—Created in 1978 by gift of Katharine Graham, to be loaned to deserving and needy students.

Himes Loan Fund (1957)—Created by Joseph H. Himes.

Kellogg Medical School Loan Fund (1942)—Created by the W. K. Kellogg Foundation, to be loaned to students.

Dr. Esther A. Nathanson Memorial Medical Loan Fund (1977)—Created in memory of Esther A. Nathanson, A.B. 1922, M.D. 1925, by her sister, Sadie C. Nathanson, to be loaned to deserving and needy students.

Pfizer Loan Fund (1953)—Created by Charles Pfizer and Company, Inc., to be loaned to students.

School of Medicine Medical Student Loan Fund (1952)—Created by School of Medicine students and augmented by a bequest from the estate of Ethel L. Murray, to be loaned to students.

Strauss Medical School Loan Fund (1975)—Created by gift of Lewis H. Strauss and Mrs. Lewis L. Strauss in memory of Honorable Lewis L. Strauss, to be loaned to students.

Student Council Loan Fund (1977)—Created by the proceeds from the annual Medical School Follies, to be loaned to students.

Sutherland Loan Fund (1941)—Created by gift of Rose L. Sutherland and other donors.

Waller Loan Fund (1973)—Bequest of Helen S. Waller, to be loaned to deserving and needy students.

Janice and George Wasserman Medical Student Loan Fund (1978)—Created by the George Wasserman Foundation, Inc., to be loaned to deserving and needy students.

Wrather Loan Fund (1967)—Created by gift of Mrs. W. E. Wrather in memory of her husband, to be loaned to students.

In addition, financial assistance is available through the following:

Catherine Breen Student Loan Fund (1972)—Established by alumni of the School of Medicine and Health Sciences in honor of Catherine Breen, former Assistant to the Dean of the Medical Center. Available to needy students who are candidates for the degree of Doctor of Medicine. Applications should be made to the George Washington University Medical Alumni Association.

Health Professions Student Loan Program—This fund is available to a full-time student pursuing a course of study leading to the degree of Doctor of Medicine. Interns, residents, students engaged in premedical or other professional training, and students enrolled in programs of study other than those leading to the degree mentioned above are not eligible for these loans.

A candidate must (1) be a citizen of the United States or have such immigration status and personal plans as to indicate an intention to become a permanent resident of the United States, (2) be in "exceptional financial need" according to federal regulations, and (3) be in good standing with the School.

National Direct Student Loan Program—This fund is available for full-time students in good standing with the school in which they are enrolled. Students must be citizens or permanent residents of the United States. All loans from the program are made on the basis of financial need.

Jessie B. Martin Loan Fund (1967)—Established by friends of Jessie B. Martin, former Editor of Academic Publications at the University. An emergency fund for loans up to $200, repayable in 30–60 days, with interest rate of 7% per annum. Application should be made to the Director of the Office of Student Financial Aid of the University.

Prizes

Janet N. Glasgow Award of Outstanding Achievement, American Medical Women's Association, Inc.—Awarded annually if the student ranking first in the graduating class is a woman.

American Medical Women's Association, Inc., Scholarship Achievement Citation—Awarded annually to those female students who are considered "honor graduates."

CIBA-Geigy Award for Outstanding Community Service—Awarded annually to a member of the sophomore class who has performed laudable extracurricular activity within the community.

Samuel M. and Miriam S. Dodek Award (1967)—Established in memory of Professor Bernhard Zondek, the eminent discoverer of the endocrinology of the human female reproductive cycle. Awarded annually to a member of the graduating class who has attained a commendable knowledge and understanding of the field of female endocrinology.

Allie S. Freed Award (1957)—Awarded annually to a member of the graduating class who has demonstrated exceptional proficiency in the field of preventive medicine.

Walter Freeman Award (1966)—Awarded annually to a student in the graduating class who submits the best essay based on original investigation.

Donald H. Glew Memorial Awards—Awarded annually to the winners of the Beaumont Day Competition in student research.

James Douglas Goddard Award in Pharmacology—Awarded annually to the outstanding sophomore medical student in pharmacology.

Alec Horwitz Award (1959)—Awarded annually to a senior who has demonstrated exceptional proficiency in the field of surgery.

Alec Horwitz Memorial Scholarship Award (1984)—Awarded annually to a member of the sophomore class who attains the highest score on the National Board of Medical Examiners Part I examination.

Oscar Benwood Hunter Award (1952)—Established by the George Washington University Medical Society, now known as the George Washington University Medical Alumni Association. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in pathology.

Jacobi Medical Society Award (1962)—Established in memory of Dr. Abraham Jacobi, the founder of pediatrics practice in the United States. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in pediatrics.

Howard Kane–A.F.A. King Obstetrical Society Award (1937)—Established in memory of Dr. Howard Kane and Dr. A.F.A. King, who served as Professors in the School of Medicine and Health Sciences. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in obstetrics and gynecology.

Dr. Harold Lamport Biomedical Research Award—Established by the Lamport Foundation in memory of the late, distinguished physiologist, Dr. Harold Lamport. Awarded annually to the student writing the best paper on original laboratory investigation in physiology.

Lange Medical Publications Prize—Awarded annually to two members of the graduating class who are considered outstanding.

Huran W. Lawson Award (1957)—Established by Mrs. Lawson in memory of her husband, who was a distinguished member of the Medical Staff of the

University. Presented annually to a member of the graduating class who has demonstrated exceptional proficiency in the field of obstetrics and gynecology.

Lemmon Company Student Award—Awarded annually to a member of the graduating class who has demonstrated outstanding ability in medicine.

Benjamin Manchester Award (1966)—Established by a grateful patient in honor of Dr. Benjamin Manchester, clinical professor of medicine. Awarded annually to a member of the graduating class who has an outstanding record and shows promise of real humanitarianism in the practice of medicine.

Merck Manual Awards—Awarded annually to four members of the graduating class who show high scholastic achievement in medical studies.

C. V. Mosby Book Awards—Awarded annually to three members of the graduating class who are considered outstanding by their classmates. The prize consists of the graduate's choice of a book published by C. V. Mosby Company.

Julius S. Neviaser Award (1956)—Awarded annually to a member of the graduating class who has demonstrated outstanding ability in the clinical aspects of orthopaedic surgery.

John Ordronaux Award (1907)—By bequest, awarded annually to the member of the graduating class who has the highest scholastic standing.

Hyman R. Posin Prize—Awarded annually to a member of the graduating class who has demonstrated outstanding sensitivity to neurologic patients and superior knowledge of neurology.

Walter F. Rosenberg Award (1980)—Awarded to the senior medical student who shows the greatest interest, proficiency, and scholastic achievement in dermatology.

Sandoz Award—Awarded annually to a member of the graduating class who has demonstrated exceptional proficiency in the field of psychiatry.

William G. Schafhirt Award—By bequest, awarded annually to a senior student for the best original essay or thesis on some medical subject of current public interest.

Upjohn Achievement Award—Awarded annually to a member of the graduating class selected by his or her classmates on the basis of outstanding scholastic and personal achievement.

Honor Societies

Alpha Omega Alpha—National Honor Medical Society. Third- and fourth-year candidates for the M.D. degree meeting the qualifications specified by the constitution of the Society are eligible for election to membership.

William Beaumont Medical Society—Medical students who have performed original research in the life sciences are eligible for membership, based on the submission of an acceptable abstract of the research and election by Society members. Outstanding students present their research findings at the annual Student Research Day. The Society also sponsors guest lectures in medical research and assists students in finding research opportunities within the Medical Center.

Howard Kane–A.F.A. King Obstetrical Society—The 15 third- and fourth-year candidates for the M.D. degree who maintain the highest grades in their work in obstetrics are eligible for membership.

Center for Aging Studies and Services

The Center offers opportunities for learning through a multidisciplinar comprehensive, gerontology/geriatrics program. The program encompass education, training, research, and direct service activities in the field of agi throughout the University. The Center for Aging Studies and Services is base in the Department of Health Care Sciences. Its major components in t Medical Center are the programs in Geriatric Medicine and in Gerontolo and the Adult and Geriatric Nurse Practitioner Program.

Geriatric Medicine Programs

The geriatric service provides primary care to patients over age 65 i outpatient clinics, specialty clinics, and the emergency room in the Medi Center. Rounds take place daily in the University Hospital and several are nursing homes. In the outpatient geriatric clinics, comprehensive assessmen and follow-up of patients' physical and mental health, social and econom status, and ability to carry out the tasks of daily living are coordinated a conducted by a geriatric team consisting of a geriatrician, a primary car resident, a social worker, and a physician assistant or nurse practitioner Students may develop an area of concentration in geriatrics/gerontolog through the Center for Aging Studies and Services.

Geriatric content is included in the second-year basic curriculum and i the required course Issues in Health Care (HCS 369). The required primary care clerkship for third-year students includes a rotation on the geriatric service, and electives in clinical geriatrics are available for first-, second-, and fourth-year students.

Program Activities in Gerontology

Gerontology activities within the Center for Aging Studies and Services are made possible through formal and informal linkages with community-based agencies that serve the elderly and with other schools within the University. Both arrangements provide opportunities for students in the Medical Center to expand their knowledge about older persons and develop skills in direct work with the elderly.

Medical students and health practitioner students are encouraged to take part in ongoing service projects or help create new ones through the Community Outreach Program for the Elderly. The field experiences made possible through this program provide students with opportunities to learn through direct service activities in the home and in community-based sites. Service learning activities include needs assessment interviews in the home to identify need for services and follow-up; monitoring and advocacy activities to help elderly persons with needed services that will prevent untimely and inappropriate institutionalization; health talks at senior centers to inform elderly persons about how to care for themselves; work with older persons in community-based service agencies to develop and implement interdisciplinary health, education, and physical fitness programs; and participation in seminars designed to augment field experiences.

In addition to the outreach programs that provide experimental learning in aging, courses with specific focus on aging, offered by several schools in the University, provide opportunities for developing special knowledge in the area of aging.

A Master of Arts with a concentration in gerontology is available through the Graduate School of Arts and Sciences. In addition to the courses under Health Care Sciences (HCS 193, 194) and Psychiatry and Behavorial Sciences (Pchi 417), the following are examples of courses in aging offered by other University departments.

Educ 344 Adult Development and Aging
Educ 353 Counseling Older Persons
Educ 383 Interviewing/Counseling for Human Resource Developers
Gern 201 The Biology of Aging
Gern 205 Public Policy and Aging
Gern 290 Practicum in Gerontology
HSA 235 Human Services Integration
HSA 236 Introduction to Long-Term Care Administration
HSA 237 Managing the Long-Term Care Institution
HSA 255 Issues in Gerontology
Psyc 188 Attitudes Toward Death and Dying
Soc 151–52 Problems of Urban Social Systems
Soc 160 Death and Dying: A Sociological Perspective
Soc 181 Major Social Processes
Soc 254 Seminar: Methods in Social Policy Research
Soc 280 The Sociology of Aging

Adult/Geriatric Nurse Practitioner Program

The Nurse Practitioner Program prepares registered nurses to practice mainly in primary care settings of long-term care facilities. The program consists of two semesters of course work and one semester of clinical experience. For more detail on the curriculum of this program, see the description under Allied Health Programs.





Undergraduate Programs in Allied Health Sciences

The School of Medicine and Health Sciences offers a broad range of undergraduate programs in allied health sciences, providing didactic and clinical preparation in selected disciplines that complement the medical profession in the delivery of health care services. The School's faculty, cognizant of the nation's intricately structured health care system, recognizes the interdependent roles and responsibilities of the network of professionals who bring a variety of skills and expertise to the health care team. The faculty is committed, therefore, to address the following issues: the increase in local and national demand for competent mid-level health professionals; the need to employ innovative instructional techniques to train such personnel in an academic health center; and the emergence of new roles that require development of professional competencies through the introduction of new curricula in allied health education.

The School of Medicine and Health Sciences offers programs leading to the degree of (1) Associate in Science, with a major in Medical Laboratory Technique,* Nuclear Medicine Technology, Prehospital Clinical Medicine, or Radiologic Technology*; (2) Bachelor of Science in Health Science*, with a major in Advanced Hospital Corps School or Nuclear Undersea Medical Technology; and (3) Bachelor of Science, with a major in Emergency Medical Services Administration, Medical Record Administration, Medical Technology, Nurse Practitioner, Nursing Anesthesia, Physician Assistant, or Radiologic Sciences and Administration.

In addition, certificates are awarded to students in the following programs upon successful completion of all program requirements: Medical Record Administration, Medical Technology, Nuclear Medicine Technology (on-campus students only), Nurse Practitioner, Nursing Anesthesia, and Physician Assistant.

Admission

An application for admission to degree candidacy in any of the allied health programs must be accompanied by a nonrefundable $20 fee, payable by check or money order to George Washington University. The application fee is waived for GWU Medical Technology students who are applying to the clinical (fourth) year of the program, off-campus military students, and students applying for readmission who were enrolled as degree candidates at the time of their last registration at this University and who have not since registered at any other institution.

Application forms are available upon request from the program office to which a student seeks admission, except for the first three years of the Medical Technology program. Such applicants should request forms from the Office of Admissions, George Washington University, 2121 Eye Street, N.W., Washington, D.C. 20052. Applicants should refer to the individual program requirements (see pp. 66–80) for the appropriate mailing address and for information on additional prerequisites, supportive documents, and application deadlines.

*Off-campus military students only.

since these vary by program. Application forms for **readmission** are available from the Office of Allied Health Administration, George Washington University School of Medicine and Health Sciences, 2300 Eye Street, N.W., Washington, D.C. 20037. Completed applications, whether for admission or readmission, must be returned to the Office of Admissions, George Washington University, 2121 Eye Street, N.W., Washington, D.C. 20052 (off-campus military students should return their forms for **readmission** to the Office of Allied Health Administration).

Entrance Requirements and Credentials

In addition to the general information that follows, applicants should refer to the individual program sections, beginning on page 66, for specific information on additional requirements. Applicants should note that all transcripts and scores must be official copies forwarded directly from the registrar of the institution attended or the issuing agency to the Office of Admissions. Photostatic copies submitted by the applicant are not acceptable.

For the Applicant with No Previous Academic Credit

1. An official transcript showing that the applicant has graduated with an acceptable record from an accredited secondary school.
2. Official scores on the Scholastic Aptitude Test (SAT)* of the College Board, if the applicant has completed secondary school within two years of the date of application to an allied health program. (If the applicant has completed secondary school more than two years before the date of application, other tests will be required during the application process.)†
3. Service school records, where applicable.

For the Applicant with Fewer than 12 Semester Hours of Academic Credit

1. An official transcript showing that the applicant has graduated with an acceptable record from an accredited secondary school or has acceptable GED scores.
2. Official scores on the SAT or ACT, for applicants who completed secondary school within two years from the date of application.†
3. Official transcripts from each academic institution attended, regardless of whether credit was earned or desired.
4. Service school records, where applicable.

For the Applicant with 12 or More Semester Hours of Academic Credit

1. An official transcript showing that the applicant has completed acceptable course work at an accredited college or university, has maintained a cumulative quality point index (QPI) of 2.00 out of a possible 4.00, is in good standing as to scholarship and conduct, and is eligible to return to the academic institution most recently attended in the same semester for which

*The SAT is preferred; the American College Testing (ACT) battery scores may, however, be substituted.

†Except off-campus military students. The Office of Admissions will notify any student who is required to take other tests.

admission is now sought at George Washington University. Students who have been academically dismissed or suspended more than twice are ineligible for consideration for at least five years from the date of their last suspension or dismissal.

2. Service school records, where applicable.

Students From Foreign Institutions

Required Records

Applicants must request all educational institutions attended to send official credentials listing subjects studied, grades received, examinations taken, and degrees received directly to the Office of Admissions, George Washington University, 2121 Eye Street, N.W., Washington, D.C. 20052. Certified copies of diplomas and certificates from secondary schools and all colleges and universities attended are required. Records of state examinations and certificates are also required. If these documents have been recorded in a language other than English, the copies must be accompanied by an English translation. Students who have taken an English composition course at a foreign institution must take either the English Validating Examination or additional composition courses from an accredited U.S. institution. All records become the property of the University and cannot be returned.

Language Tests

Students whose native language is not English may be required to take the *Test of English as a Foreign Language* (TOEFL) and have the scores submitted to the Office of Admissions. Students are responsible for making arrangements to take the test and should address inquiries to TOEFL, Educational Testing Service, Princeton, N.J. 08541, U.S.A., well in advance of the beginning of the semester for which admission is sought. The test fee remitted with the application entitles the student to have the test score sent to three different institutions. Registration for the TOEFL does not constitute application for admission to George Washington University.

The *Bulletin of Information*, obtainable without charge from the Educational Testing Service, contains the following: a description of the test as well as rules regarding application, fees, reports, and the conduct of the test; lists of examination centers; examination dates; and an application blank. On the application form, students should specify that the scores be sent to the Office of Admissions, George Washington University, 2121 Eye Street, N.W., Washington, D.C. 20052.

In addition to the TOEFL requirement, the Office of Admissions may require an admitted student to take an English Placement Test for Foreign Students prior to registration. The results of this test may determine the courses for which the student will be permitted to register in the proposed program of study.

Advance Tuition Deposit

Upon notification of acceptance, a $100 tuition deposit will be required of all full-time, on-campus undergraduate students. The deposit is credited toward tuition and is not refundable.

Admission as an Unclassified Student

A student who wishes to take individual courses in allied health programs without applying for degree candidacy must apply for admission to the University as an unclassified undergraduate student in the School of Medicine and Health Sciences. The Assistant Dean, in conjunction with the appropriate program director and the chairman of the department offering the course, will determine whether admission will be granted to unclassified students. Credits earned for courses taken as an unclassified student may be transferred to degree programs at the University provided the courses are applicable to the particular degree program to which the student has been admitted. Permission to take individual courses, if granted, will be limited to six semester hours per student.

Advanced Standing

Advanced standing may be awarded toward the associate's and bachelor's degrees for appropriate course work completed at other accredited academic institutions with a minimum grade of *C*. Advanced standing may also be awarded for nontraditional classroom or clinical experience. The University reserves the right to refuse credit for transfer in part or in whole.

It is the student's responsibility to request that certified, official transcripts of all course work taken at other institutions and the results of examinations be sent by the issuing institution or agency directly to the Office of Admissions, George Washington University, 2121 Eye Street, Washington, D.C. 20052. If the applicant has fewer than 12 semester hours of acceptable transfer credit (grades of *C* or better on academic work from an accredited institution) at the time the application is submitted, the applicant's secondary school record must also be sent directly from the school to the Office of Admissions.

Degree candidates who are currently enrolled at this institution must obtain permission from the Office of Allied Health Administration before registering to take examinations or courses at other accredited institutions.

Transfer Credit from Academic Institutions—Allied health degree programs vary in the amount of advanced standing they will award. Students may obtain further information from the Office of Allied Health Administration.

Credit for Nontraditional Classroom or Clinical Experience—Credit may be awarded on the basis of nontraditional classroom or clinical experience, by a combination of any of the following methods:

Credit from Service Schools—A limited amount of credit may be assigned for selected service school instruction. Current military students must submit an official DD Form 295; copies of service school records are not acceptable. Veterans should submit photostatic copies of their discharge papers.

Special Departmental Examinations—A student may request approval from the Assistant Dean through the Program Director to petition the department to take a special examination covering the subject matter of a specific course. Approval of such a request is not granted automatically. The student must offer evidence of sufficient occupational or educational background to indicate a reasonable command of the subject matter. Assignment of credit by special departmental examination will depend on the department's evaluation of the examination. The examinations will normally be of at least three hours' duration. A fee of $25 for each course examination is charged.

preparing, administering, and grading the examination. (In some instances, students may instead request approval to take a waiver examination, in order to satisfy a curriculum requirement. Students do not receive academic credit for waiver examinations. The examination will normally be of at least one hour's duration; a fee of $5 for each waiver examination is charged.)

Credit for College Board College-Level Examination Program (CLEP)—CLEP offers two types of examinations: General and Subject Examinations. CLEP General Examinations are offered in five areas: mathematics, social sciences, humanities, natural sciences, and English composition. The CLEP General Examination in mathematics will not fulfill any degree requirements for allied health students; only the Subject Examination is acceptable in this area. CLEP Subject Examinations measure achievement of specific college-level courses and are offered in more than 20 subjects.

Upon admission to degree candidacy, credit is assigned for the General Examinations passed with an acceptable score. (George Washington University will not assign credit for the CLEP General Examination in English composition; it may be taken as a Subject Examination only.) Credit is usually assigned for the Subject Examinations passed at the level recommended in the College Board model policy. Credit may not be earned by passing the examination after taking an equivalent course. Arrangements for taking the examinations are solely the responsibility of the applicant and should be made through the College Board College-Level Examination Program, Box 592, Princeton, N.J. 08541.

Credit for New York State Board of Regents Examination—Applicants for degrees who present proper certification of the award of a degree at the associate's level from the New York State Board of Regents may be awarded a maximum of 60 semester hours of advanced standing.

Readmission

Students previously registered in the University, but not during the immediately preceding semester (summer sessions excluded), must apply for readmission. Students who were previously registered as unclassified, or who attended one or more academic institutions during their absence from this University and now wish to apply for admission or be readmitted to a degree program, must have their official transcripts sent directly to the Office of Admissions at this University from each institution attended (off-campus military students who have attended additional service schools must also submit an updated DD Form 295). Applications for readmission are evaluated on the basis of regulations currently in effect.

The application fee is waived for students applying for readmission who were registered as degree candidates at the time of the last registration at this University and who have not registered at another institution in the interim period.

Regulations for Undergraduate Students in Allied Health Programs

Attendance

Students may attend only those classes for which they are registered. Regular attendance is expected; students may be dropped from any course for undue absence.

Scholarship Requirements

Grades

Grades are mailed to students by the Office of the Registrar at the close of each semester. They are not given out by instructors.

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *IP*, In Progress; *W*, Authorized Withdrawal; *Z*, Unauthorized Withdrawal. Except for courses that specifically state that repetition for credit is permitted, a candidate for a degree at this University may not repeat for credit a course in which a *D* or better was received, unless a petition to do so is approved by the Assistant Dean upon recommendation of the program director. Whenever a grade has not been assigned, *I* (Incomplete), *IP* (In Progress), *W* (Authorized Withdrawal), or *Z* (Unauthorized Withdrawal) will be recorded. *I* indicates that the instructor has received a satisfactory explanation for the student's inability to complete the required work of the course in time to meet the University's deadline to submit grades and that the instructor has been informed of and has approved such reasons before the stated deadline. The grade of *I* may be submitted only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course that is not satisfactorily explained to the instructor before the date when grades must be turned in will result in the student's receiving an *F*. An *I* automatically becomes an *F* one calendar year after the date of the last class meeting in the semester for which the *I* was assigned. *IP* is reserved for courses (e.g., clinical rotations) in which the final date extends beyond the official University deadline for submitting grades.

The Quality-Point Index

Scholarship is computed in terms of the quality-point index (QPI), obtained by dividing the number of quality points by the number of semester hours for which the student has registered, both based on the student's record in this University. Quality points are computed from grades as follows: *A*, four points; *B*, three points; *C*, two points; *D*, one point; *F*, no points, for each semester hour for which the student has registered. (Grades of *F* will be computed in the QPI but will not be considered as fulfilling degree requirements.) Courses in which *W*, *I*, or *IP* are assigned are not considered in determining the index, except that any course in which an *I* or *IP* has been assigned will be included later, when a formal grade has been recorded. Grades earned at other institutions are not included in computing the QPI.

Dean's List

Students who achieve a QPI of 3.50 or higher in any one semester are placed on the Dean's List for that semester. The list is limited to full-time students registered for a minimum of 12 semester hours.

Probation

Students who have attempted a minimum of 12 semester hours of course work and whose cumulative QPI is below 2.00 will be placed on academic probation

for the period in which they next attempt 12 additional semester hours of work.

Students whose attendance or conduct has been unsatisfactory may be placed on **disciplinary probation** for the period in which they next attempt 12 additional semester hours of work.

Suspension

Any student whose cumulative QPI remains below 2.00 after a 12-semester-hour period of probation may be suspended. A student suspended for poor scholarship may not register for course work, even as an auditor. The student may apply for readmission after the lapse of either the fall or spring semester following suspension. Evidence must then be presented to the Assistant Dean, through the appropriate program director, demonstrating that the student is now better prepared to pursue college-level course work. Any student suspended twice for poor scholarship will not be readmitted.

Dismissal

Any student who has received one or more failing grades during any one semester may be recommended for dismissal by the program director. Such recommendation will be reviewed by the Assistant Dean and the Dean for Academic Affairs; at the Dean's discretion, the recommendation may also be reviewed by a faculty committee.

Withdrawal

Dropping courses or withdrawing from the University requires the approval of the student's advisor, each course instructor, and the Assistant Dean. Permission to withdraw from the University, however, will not be granted to a student who does not have a clear financial record (see *Withdrawals and Refunds*, p. 63). The deadline for withdrawal from a course will fall at the end of the fourth week following general registration each semester (except for off-campus military students).

All charges for courses dropped without the approval of the Assistant Dean must be met by the student. Reporting the dropping of a course to an instructor does not constitute an official withdrawal.

Adding Courses

The deadline for adding a course occurs at the end of the second week each semester following general registration.

Changes in Program of Study

Changes Within the School of Medicine and Health Sciences' Allied Health Programs—Students may not substitute one course for another, drop courses (see *Withdrawal*), or change their status from credit to audit or audit to credit without the approval of their faculty advisor, the course instructor, and the Assistant Dean.

Transfer Within the University—Students who wish to transfer to another college, school, or division must apply through the Office of Admissions. A

maximum of 30 semester hours earned in the Division of Continuing Education may be applied toward a bachelor's degree in the School of Medicine and Health Sciences.

Credit

Credit is awarded only after registration for a course and satisfactory completion of the required work or upon the assignment of advanced standing in accordance with the regulations of the several colleges, schools, and divisions.

Auditing

A student who has been admitted to any one of the allied health programs may register as an auditor in a class, only with the permission of the instructor and the faculty advisor and approval of the Assistant Dean. An auditor receives no academic credit and is not required to take active part in the class or to pass examinations. A student who receives permission to audit a course may not repeat it later for credit. The on-campus tuition rate is applied to audited courses.

Balance Sheet

After a student has been admitted and registers in a particular degree program, program coordinators in the Office of Allied Health Administration will issue a balance sheet showing the amount of course work already completed and the degree requirements still to be met. A second balance sheet is issued only if the student changes the major.

Transcripts of Record

The Office of the Registrar will issue official transcripts of student records upon request of a student or former student who has a clear financial record. A fee of $2 is charged for each transcript. When more than two transcripts are requested at the same time, a $2 fee is charged for each of the first two transcripts, with a 50¢ fee for each additional transcript.

Continuous Enrollment Procedures

Students who have fulfilled their program requirements but not their degree requirements are expected to be continuously enrolled and actively engaged in fulfilling the requirements for the degree each semester of the academic year until the degree is conferred. Students who break continuous enrollment at the University and do not request and receive a leave of absence (see below) or assignment to inactive status (see below) by the Assistant Dean must apply for readmission and, if granted, be subject to the requirements and regulations then in force. Students who plan to attend other institutions and apply transfer credit toward graduation from this University must first obtain written approval from the Assistant Dean.

Leave of Absence

Students who find it necessary to interrupt active pursuit of their degree must submit a petition to the Assistant Dean through the program director.

requesting a leave of absence for a specific period of time, generally limited to one calendar year. If their petitions are approved, students must then complete and return a Continuous Enrollment Form to the Office of Allied Health Administration. Degree candidates who discontinue active enrollment in their studies without being granted a leave of absence, or students granted leaves who do not return to active study at the close of the period of approved absence, must apply for readmission and be subject to the regulations and requirements then in effect. Students are assessed no fees while on leave of absence.

Inactive Status

Students may request permission to be placed on inactive status. A Continuous Enrollment Form for this purpose should be initiated by the student and approved by the program director and the Assistant Dean during the registration period for the semester involved. (Off-campus military students will receive Continuous Enrollment Forms in the mail automatically, provided they have maintained continuous enrollment at this University.) Such permission, if approved, will maintain a student's enrollment at George Washington University. Inactive status will also enable students to complete approved course work at another institution and have that credit applied toward their remaining degree requirements.

Graduation Requirements

Degrees are conferred in February, May, and September. Graduating allied health students may participate in the School of Medicine and Health Sciences commencement ceremony, held each year in May.

To be recommended for graduation by the faculty, students must have met the admission requirements of the college or school in which they are registered; have completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree; and be free from all indebtedness to the University. Registration, either for course work or for continuous enrollment, is required for the semester or summer session at the close of which the degree is to be conferred.

Application for Graduation—An Application for Graduation Form must be filed at the time of registration for the last semester or summer session of the final year.

Scholarship—Students must meet the scholarship requirements for the particular degree for which they are registered.

Curriculum—Minimum curriculum requirements for each degree are given on pages 66–80.

Attendance and Conduct—The University reserves the right to refuse to confer a degree upon a candidate whose attendance or conduct has been unsatisfactory.

With Distinction

Students in allied health programs must earn a minimum QPI of 3.50 in all course work completed at this institution to be eligible for a bachelor's degree conferred with distinction. Students must also have completed at least one-half of the semester hours required for the degree at this institution.

Award of Certificates

Certificates will be awarded to those students who successfully complete all of the requirements in one of the following programs: Medical Record Administration, Medical Technology, Nuclear Medicine Technology, Nurse Practitioner, Nursing Anesthesia, and Physician Assistant. In addition to completing all the stated requirements for the certificate, students must be free from all financial indebtedness to the University.

Fees and Financial Regulations for Undergraduate Students in Allied Health Programs

Fees paid by students cover only a portion of the cost of the operation of the University. Income from endowment funds, grants, and gifts from alumni and friends of the institution make up the difference.

The following fees and financial regulations were adopted for the 1985 summer sessions and the academic year 1985–86.

Tuition Fees*

On campus, each semester hour, not to exceed $3,675 per semester	$275.00
Off campus, each semester hour	185.00
Summer Sessions, each semester hour	223.00
Off-campus military	†

University Center Fee

(charged all students registered on campus)

Each semester hour, not to exceed $82.50 per semester	7.75

Additional Course Fees

In certain courses offered by Columbian College of Arts and Sciences, additional fees, such as laboratory and material fees, are charged as indicated in the course descriptions in the *Undergraduate and Graduate Programs Bulletin*. These fees are charged by the semester and, unless otherwise indicated, may be defrayed in two payments when the tuition is paid in this manner. If breakage of apparatus is in excess of the normal amount provided for in the laboratory fee, the individual student will be required to pay such additional charges as are determined by the department concerned.

*Please check with the office of Allied Health Administration for tuition fees that apply to the various on-campus programs; to the fourth year of the Medical Technology Program; to degree candidates who have completed the certificate portion of their programs; and to off-campus military students (off-campus military tuition rates are set by contract). The annual tuition for the Nurse Practitioner and Physician Assistant Programs is payable in three equal installments on or before registration for each semester (the Summer Sessions portion of the programs is considered a full regular semester).

†Off-campus military tuition rates are set by contract.

Computer Usage Fees

(charged for courses that use the computer facilities of the University)

Applicable fees are listed in the *Schedule of Classes* for each semester. The fee is $50 per course, but no student will be charged more than $100 per semester for computer use.

Residence Hall Fees

(See pages 14–15)

Special Fees and Deposits

Application fee (nonrefundable)	$20.00
Advanced tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student	100.00
Housing deposit, nonrefundable, charged each applicant for residence hall space	200.00
Admission tests (when required)	15.00
Late-registration fee, for failure to register within the designated period:	
During first week of classes	25.00
During second and third weeks of classes	50.00
After third week of classes (if permitted)	100.00
Late-payment fee, for failure to make payments when due (see *Payment of Fees* below)	15.00
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see *Payment of Fees* below)	35.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason	15.00
Special Columbian College of Arts and Sciences departmental examination to qualify for receiving credit (advanced standing), waiver of requirement, or both	25.00
Waiver examination to qualify for advanced placement	5.00
English test for international students (when required)	10.00
Laboratory checkout fee, for failure to check out of chemistry laboratory by the deadline date set by the instructor*	10.00
Transcript fee	2.00
If two or more transcripts are requested at the same time, fee for each of the first two copies is $2; fee for each additional copy	.50
Replacement of lost or stolen picture identification card	2.00

Registration for on-campus courses in the University entitles each student to the following: (1) the services of the Career Services Center; (2) the use of the Melvin Gelman Library; (3) gymnasium privileges; (4) admission to all athletic contests, unless otherwise specified; (5) subscription to the *GW Hatchet*, the student newspaper; (6) admission to University debates; and (7) medical attention as described under *Student Health Service*. These privileges terminate when the student withdraws or is dismissed from the University.

*A student who drops a chemistry course before the end of the semester must check out of the laboratory at the next laboratory period.

Payment of Fees

No student is permitted to complete registration until all charges are paid or until arrangements for payment have been made. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks and postal money orders should be made out to George Washington University, with the student identification number in the upper left corner.

The Student Accounts Office is responsible for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration. This contract permits payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the eighth week of classes for the fall and spring semesters. Only full-time students enrolled either in the Nurse Practitioner or Physician Assistant Program may defer payment for the summer sessions. Interest at the rate of 8% per annum on the unpaid balance will be charged from the date of registration to the date payment is made. A 10-month payment plan is also available. Please note that no student will be eligible to receive a certificate in any program until the Office of Allied Health Administration receives notification of clearance from the Student Accounts Office.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $800 or more. Under such circumstances the student may be permitted to pay one-half of the amount due from the student at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will automatically be charged a $15 late-payment fee, and will be subject to an interest charge of 8% per annum. Accounts that become 30 days past due will be financially encumbered. When a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due the University in addition to a financial reinstatement fee of $35.

Returned-Check Policy

A student whose check is returned unpaid by a bank for any reason will be charged a returned-check fee. If the check is not paid within 15 days, the student's account will be financially encumbered, with the same penalties and restrictions as for late payment described in the previous section.

One-Year Prepaid Tuition Plan

Undergraduate students paying the set upper limit of tuition may receive a discount for the spring semester if payment is made for the full academic year at the time of fall registration. At the 1985–86 rate, students choosing this plan would pay $7,275 for two semesters instead of $7,350.

Four-Year Prepaid Tuition Plan

New undergraduate students may elect to pay in advance the total tuition for their full four-year program at the rate applicable to their first year. A payment under this plan for programs beginning with the 1985 fall semester would total $29,400. Refunds to students who do not complete their full four-year programs would be made at the original rate for all remaining full semesters.

Commercial Prepaid and Deferred Payment Plans

Several commercial programs for those who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs but will be happy to provide guidance to students and parents.

Withdrawals and Refunds

Applications for withdrawal from the University or for change in class schedule must be made in writing to the Assistant Dean. (Regulations concerning withdrawal and refunds for the summer sessions are stated in the *Summer Sessions Schedule of Classes.*) Notifying an instructor is not an acceptable substitute (see *Withdrawal*, p. 57).

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. **Complete withdrawal from the University:**

   Withdrawal dated on or before Friday of the first week of classes 90%
   Withdrawal dated on or before Friday of the third week of classes 75%
   Withdrawal dated on or before Friday of the fifth week of classes 50%
   Withdrawal dated after the fifth week of classes . . . . . none

2. **Partial withdrawal:** If the change in program results in a lower tuition charge, the refund schedule above applies to the difference.

3. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be reduced or refunded because of absence from classes.

Authorization to withdraw and certification for work done will not be given to any student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

Financial Aid

For full-time undergraduate students, George Washington University has a program of financial assistance consisting of scholarships, loans, grants, part-time employment, or any combination of these resources. The University participates in the National Direct Student Loan, Supplemental Educational Opportunity Grant, and College Work-Study programs. Financial aid is **awarded on the basis of the student's scholastic record, financial need,** and qualities of leadership. Complete information concerning financial assistance is available from the Office of Student Financial Aid, George Washington University, 2121 Eye Street, N.W., Washington, D.C. 20052. Students intending to apply for financial aid should submit the completed financial aid application form, together with the general application form, since all applications for financial aid **must be filed by March 1**, regardless of whether the **student has been admitted by that date.** (Check with the Office of Allied Health Administration for application deadlines for spring or summer semesters only.)



Requirements for the Degree of Associate in Science

The satisfactory completion of a minimum of 60 semester hours of course work is required for the degree of Associate in Science; some programs, however, may set the requirements above the minimum. The course work must be distributed as follows:

Human Competence—A minimum of six semester hours in English composition (Engl 9 or 10 and 11 or 12) or the equivalent, plus a minimum of six semester hours to be selected from course offerings in the humanities, social sciences, or mathematics.*

Core Curriculum (Required Courses)—The core curriculum is dictated by the specific requirements of the individual program. The number of semester hours varies slightly from program to program, but a minimum of 48 semester hours is required for an Associate in Science degree.

Students who plan to pursue a bachelor's degree later are advised to plan their associate's degree program so that, where possible, they will satisfy the prerequisites of the baccalaureate.

Scholarship Requirements

A minimum cumulative QPI of 2.00 is required for course work leading to the degree of Associate in Science. A minimum cumulative QPI of 2.50 is required for course work in the core curriculum. (See page 56 for an explanation of the grading system and the QPI; see individual program descriptions for information on the core curriculum.) A student whose QPI in the core curriculum falls below 2.50 in any one semester will receive a warning letter.

Residence Requirement

A minimum of 18 semester hours of course work in the major must be satisfactorily completed in residence in the School of Medicine and Health Sciences.

Medical Laboratory Technique Program

The program of study leading to the degree of Associate in Science with a major in medical laboratory technique is offered only to off-campus military students.

Admission to Degree Candidacy

General requirements for admission to degree candidacy are stated on pages 51–55. Students who do not meet these requirements may be considered for degree candidacy after the satisfactory completion of a probationary period of 15 semester hours of course work completed in residence at George Washington University, with a minimum QPI of 2.50.

*Mathematics electives vary according to the program. Students should check the individual program descriptions for further information.

Degree Requirements

The satisfactory completion of a minimum of 61 semester hours is required. The course work is to be distributed as follows:

Human Competence—6 semester hours of Engl 9 or 10 and 11 or 12 (or the equivalent) and 6 semester hours of college math or 3 semester hours of college math and a humanities or social science elective.

Core Curriculum (Required Courses)—Path 13, 14, 15, 16, 17, 18, 19, 20; Chem 9 (the latter is not included in computing the QPI). This requirement is fulfilled by successful completion of Medical Laboratory Technique School (NEC 8506).

Scholarship Requirements

Students must maintain an overall QPI of 2.50 in the core curriculum courses.

Nuclear Medicine Technology Program

The program of study leading to the degree of Associate in Science with a major in nuclear medicine technology is offered to on-campus students and off-campus military students.

Admission to Degree Candidacy

General requirements for admission to degree candidacy are stated on pages 51–55. Applicants must be at least 18 years of age by the time they first register as students in the program. Two letters of recommendation must be sent directly from previous instructors, advisors, or employers (except for off-campus military students). The selection process includes a personal interview for qualified applicants (except for off-campus military students). Enrollment is limited and, therefore, admission to the program is conducted by a competitive application process. Students who do not meet the standard requirements may be considered for admission to degree candidacy after the satisfactory completion of a probationary period of 15 semester hours of course work completed in residence at George Washington University with a minimum QPI of 2.50.

Degree Requirements

The satisfactory completion of at least 62 semester hours of course work is required. Anat 115 and Phyl 111, or their equivalents, are prerequisite to all other courses in nuclear medicine technology.

Human Competence—6 semester hours of Engl 9 or 10 and 11 or 12 (or the equivalent), 3 semester hours of social science (general psychology is recommended), and 3 semester hours of humanities.

Core Curriculum (Required Courses)—Rad 43, 44, 55, 56, 57, 58, 59, 65, 66, 72, 75, 81, 82, 93, 94, 98. For off-campus military students, this requirement is fulfilled by successful completion of Nuclear Medicine Technology School (NEC 8416).

Scholarship Requirements

Students must maintain an overall QPI of 2.50 in the core curriculum courses.

Applications

Application forms for on-campus students are available from the Radiologic Allied Health Programs' Office, 2300 Eye Street, N.W., Washington, D.C. 20037, (202)676-3650. The deadline for the return of completed applications is March 1.

Prehospital Clinical Medicine Program

The program of study leads to the degree of Associate in Science with a major in prehospital clinical medicine.

Admission to Degree Candidacy

General requirements for admission to degree candidacy are stated on pages 51–55. In addition to the general admission requirements, students must also submit the following records, where applicable, directly to the Office of Admissions:

1. Official scores from national registry examinations or certifying boards (where applicable).
2. Verification of satisfactory completion of prehospital clinical training and proof of current participation in an emergency medical services system.
3. Two letters of recommendation from previous instructors, advisors, or employers involved in emergency medical services.

Qualified candidates will be invited for a required personal interview. Persons admitted to the program must submit, prior to the first day of class, a letter from a physician attesting to their good health. The letter should include the results of testing for tuberculosis and a statement of current immunization status. Candidates who do not meet the academic requirements for admission may be considered for degree candidacy after the satisfactory completion of a 15-semester-hour probationary period completed in residence at the George Washington University School of Medicine and Health Sciences.

Advanced Standing

General provisions for advanced standing are listed on pages 54–55. Advanced standing may also be granted for satisfactory completion of prehospital emergency care certificate-level course work, provided the candidate submits official transcripts or records from an accredited certificate-granting medical facility. The program director also reserves the right to require a written and practical departmental examination before advanced standing credit will be awarded for course work completed by students at nonaccredited institutions. A fee of $25 will be charged for the examination.

Degree Requirements

The satisfactory completion of a minimum of 75 semester hours of course work is required.

Human Competence—Six semester hours of English (Engl 9 or 10 and 11 or 12), 8 hours each of general chemistry and biology (preferably anatomy or

physiology), 6 hours of psychology or 3 hours of psychology and 3 hours of sociology, 3 hours in Stat 51, 3 hours in Econ 1, 3 hours in Acct 51.

Core Curriculum (Required Courses)—EMed 10, 11, 12, 50, 60, 61, 62, 64, 65, 181.

Scholarship Requirements

Students must achieve an overall QPI of 2.5 in the core curriculum courses.

Applications

Application forms are available from the Director of the Emergency Medical Services Degree Programs, 2300 K Street, N.W., Washington, D.C. 20037, (202)676–4372. The deadline for the return of completed applications is June 30.

Radiologic Technology Program

The program of study leading to the degree of Associate in Science with a major in radiologic technology is offered only to off-campus military students.

Admission to Degree Candidacy

General requirements for admission to degree candidacy are stated on pages 51–55. Students who do not meet the standard requirements may be considered for admission to degree candidacy after the satisfactory completion of a probationary period of 15 semester hours of course work completed in residence at George Washington University, with a minimum QPI of 2.50.

Degree Requirements

The satisfactory completion of 61 semester hours is required, the course work to be distributed as follows:

Human Competence—6 semester hours of Engl 9 or 10 and 11 or 12 (or the equivalent), 3 semester hours of social science, and 3 semester hours of humanities.

Core Curriculum (Required Courses)—Rad 40, 41, 42, 50, 51, 60, 61, 62, 70, 71, 80, 90, 95, 96, 97, 99. This requirement is fulfilled by successful completion of Radiologic Technology School (NEC 8452).

Scholarship Requirements

Students must maintain an overall QPI of 2.50 in the core curriculum courses.

Requirements for the Degree of Bachelor of Science in Health Science

The Bachelor of Science in Health Science degree program is currently offered to off-campus military students enrolled in one of the following programs: Advanced Hospital Corps School and Nuclear Undersea Medical Technology.

Advanced Hospital Corps School Program

The program of study leading to the degree of Bachelor of Science in Health Science with a major in advanced hospital corps school is offered only to off-campus military students.

Degree Requirements

Human Competence—30 semester hours: 6 hours in English composition, 3 hours in general psychology, and 21 hours in the humanities and social sciences.

Subject Competence—11 semester hours: HCS 10, 15, and 16 are required, plus an additional 7 semester hours of didactic courses in the biological sciences, physical sciences, and mathematics. This requirement is fulfilled by successful completion of Advanced Hospital Corps School (NEC 8425).

Vocational Competence—72 semester hours: HCS 22, 54, 67, 68, 75, 83, 87, 92, 93, 96, 102, 126, 133, 175, 180 (a corresponding number of credits for approved course work may be substituted for HCS 175 and 180).

Nuclear Undersea Medical Technology Program

The program of study leading to the degree of Bachelor of Science in Health Science with a major in nuclear undersea medical technology is offered only to off-campus military students.

Degree Requirements

Human Competence—30 semester hours: 6 hours in English composition (Engl 9 or 10 and 11 or 12), 3 hours in general psychology, and 21 hours in humanities and social sciences.

Subject Competence—18 semester hours: HCS 10, 12, 15, 16, 20, and 21 are required. This requirement is fulfilled by successful completion of NEC 8402.

Vocational Competence—72 semester hours: HCS 25, 26, 66, 75, 90, 93, 96, and 133 are required. This requirement is fulfilled by successful completion of NEC 8402 and the successful completion of an additional 22 semester hours in biological sciences, physical sciences, computer science, health science, environmental science, or public administration.

Requirements for the Degree of Bachelor of Science

The satisfactory completion of a minimum of 120 semester hours of course work is required for the Bachelor of Science degree; some programs, however, may set the requirements above the minimum. See the individual program requirements for further information on the course distribution.

Scholarship Requirements

A minimum cumulative QPI of 2.00 is required for course work in programs leading to the Bachelor of Science degree. A minimum cumulative QPI of 2.50

is required for core curriculum courses. (See page 56 for explanations of the grading system and the QPI; see individual program descriptions for information on the core curriculum.) A student whose QPI in the core curriculum falls below 2.50 in any one semester will receive a warning letter.

Emergency Medical Services Administration Program

This program is designed for certified emergency medical technicians with a minimum of one year of clinical experience who are performing at an advanced life support level and wish to prepare for careers in emergency medical services administration. Training will include course work in management and communication skills, computer use, teaching, and public relations.

Admission to Degree Candidacy

The general requirements for admission to degree candidacy are stated on pages 51–55. In addition, students applying to the program must submit the following records directly to the GWU Office of Admissions.

1. Verification of satisfactory completion of prehospital clinical training and proof of current participation in an emergency medical services system.
2. Official scores from national registry examinations or certifying board examinations.
3. Verification of a minimum of one year of clinical experience at an advanced life support level.
4. Three letters of recommendation sent directly from the evaluators. One letter must be submitted by the applicant's current EMS supervisor; the two other letters must be submitted either by instructors familiar with the applicant's academic preparation or colleagues familiar with prior health care experience.

Qualified candidates will be invited for a required personal interview. Persons admitted to the program must submit, prior to the first day of class, a letter from a physician attesting to their good health. The letter should include the results of testing for tuberculosis and a statement of current immunization status.

Advanced Standing

General provisions for advanced standing are listed on pages 54–55. In addition, students may receive up to 52 semester hours of advanced standing for satisfactory completion of required course work at other accredited academic institutions. The program director reserves the right to refuse advanced standing credit in part or in whole.

Scholarship Requirements

General scholarship requirements are stated above. Candidates for a Bachelor of Science degree with a major in emergency medical services administration must achieve a cumulative QPI of 2.00 and a cumulative QPI of 2.50 in the core curriculum.

Residence Requirement

A minimum of 71 semester hours of course work in the major must be completed in residence at the School of Medicine and Health Sciences.

Degree Requirements

The program leading to the degree of Bachelor of Science with a major in emergency medical services administration requires the satisfactory completion of a minimum of 123 semester hours of course work.

Human Competence—A minimum of 52 semester hours is required, including English composition, chemistry, biology (preferably anatomy and physiology), statistics, economics, accountancy, psychology, sociology, and 15 semester hours of elective courses from the humanities, social sciences, or mathematics.

Subject and Vocational Competence—A total of 71 semester hours is required, including HSA 170, EMed 110, 115, 118, 120, 122, 124, 126, 127, 131, 133, 134, 136, 140, 150, 160, 170, 190, and 200. A minimum of three electives selected from the emergency medical services curriculum is also required.

Applications

Application forms are available from the Director, Emergency Medical Services Degree Program, 2300 K Street, N.W., Washington, D.C. 20037, (202)676–4372, and should be completed and returned no later than May 31.

Medical Record Administration Program

This program is designed for Accredited Record Technicians, medical record technicians, and individuals completing medical record science courses at the technical level who wish to become medical record administrators. The program provides an opportunity for graduates of the American Medical Record Association Correspondence Course and the Independent Study Program to receive academic credit for the medical record technology courses they have successfully completed.

Admission to Degree Candidacy

The general requirements for admission to degree candidacy are stated on pages 51–55. In addition, students applying to the program must submit evidence that they have satisfactorily completed the subject and human competence requirements as listed below under degree requirements. Two letters of recommendation must be sent directly from previous instructors or employers. A personal interview is required.

Advanced Standing

General provisions for advanced standing are listed on pages 54–55. In addition, students may receive up to 39 semester hours of advanced standing for completion of anatomy, physiology, and medical record technology courses as subject competence requirements (including courses taken in the American Medical Record Association Correspondence Course and Independent Study

Program). Students may also receive a minimum of 44 semester hours of advanced standing for human competence requirements, including credits earned from other institutions (see *Degree Requirements* below for human competence requirements).

Scholarship Requirements

General scholarship requirements are stated on pages 70–71. Students must earn a grade of *C* or better in each of the subject and human competencies and must maintain a minimum cumulative QPI of 2.50 in the major, i.e., subject and vocational competencies.

Residence Requirement

A minimum of 38 semester hours of course work in the major must be completed in residence at the School of Medicine and Health Sciences.

Degree Requirements

The program leading to the degree of Bachelor of Science with a major in medical record administration requires the satisfactory completion of a minimum of 121 semester hours of course work.

Human Competence—A minimum of 44 semester hours is required, including business communication, college algebra, economics (preferably microeconomics), English composition, humanities and social science electives, introduction to data processing, introduction to research, microbiology, principles of management, personnel management, public speaking, and statistics.

Subject Competence—A maximum of 39 semester hours is required, including anatomy, physiology, and medical record technology courses.

Vocational Competence—A maximum of 38 semester hours is required, including AHA 120, 130, 131, 132, 140; HSA 142; Mgt 120.

Applications

Application forms are available from the Director, Medical Record Administration Program, 2300 Eye Street, N.W., Washington, D.C. 20037, (202)676-5682, and should be completed and returned no later than March 1.

Medical Technology Program

The satisfactory completion of 124 semester hours of course work is required for the degree of Bachelor of Science with a major in medical technology.

Residence Requirement

A minimum of 30 semester hours must be spent in residence for the degree of Bachelor of Science with a major in medical technology. This requirement is met through satisfactory completion of Bioc 111 and the 12-month medical technology program conducted at the University Hospital in the fourth year (Path 121, 122, 123, 124, 125, 126, 130, 131, 132, and 133).

Curriculum

First Three Years

		Semester Hours
English	Engl 9 or 10 and 11 or 12	6
Humanities	6 semester hours selected from one of the following combinations: Art 31–32, 71–72; Chin 163–64; Clas 71, 72, 100, 108, 113; CmTr 45, 49, 133, 143, 144, 165, 166, 173, 192; Engl 51–52, 61–62, 71–72, 191–92; Fren 51–52, 60, 91–92; Ger 51–52, 103–4, 161–62; Hmn 1, 2, 3–4; Mus 3–4; Phil 50 and 71, 111, 112, 113, 131, 132, 151, 152, 162, or 172; Rel 9–10, 59–60, 21–22, or 23 and 9; Slav 71, 91–92; Span 51–52, 91–92	6
Mathematics	Math 30	3
Science	BiSc 11–12, 111; Micr 129	15
	4 semester hours selected from BiSc 104, 127, 128, 145, 148, 155, 163, 164, 165	4
	Chem 11–12, 22, 50	16
Social Science	6 semester hours selected from one of the following combinations: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1–2; Hist 71–72, 39–40, 72 and 91, 40 and 91; Jour 71–72, 111 and 115; PSc 1–2; Psyc 1 and another psychology course; Soc 1–2 or Soc 1 and any 100-level sociology course; SpHr 11 and any 100-level speech and hearing course	6
		18
Electives	Nonscience electives	16
	Nonscience or science electives	90

Senior Year

Path 121, 122, 123, 124, 125, 126, 130, 131, 132, 133; Bioc 111.

All pathology courses in the senior (clinical) year constitute the core curriculum. Students must achieve a minimum cumulative QPI of 2.50 in these courses in order to graduate. Path 121 is a prerequisite to all other courses in the core curriculum. Students who fail this course will not be allowed to continue in the clinical year. They may, however, apply for readmission and will be subject to the requirements and regulations then in force.

Admission to the first three years of the baccalaureate program with a major in medical technology does not guarantee acceptance into the senior (clinical) year conducted at the University Hospital; George Washington University students, however, are given preference. Each student who wishes to be considered for the clinical year must apply separately for admission during the junior year. Academic achievement in the sciences, personal interviews, and letters of recommendation will be used to evaluate candidates for admission to the senior year of study. An overall QPI of 2.00 is required in order to be considered for acceptance into the senior year. Application forms for the first three years of the program are available from the George Washington University Office of Admissions. Applicants for the senior year of study must apply personally to the Director of the Medical Technology Program, 2300 Eye Street, N.W., Washington, D.C. 20037, (202)676-2945. Admissions interviews take place between December and March.

Nurse Practitioner Program

Admission to Degree Candidacy

The general requirements for admission to the program are stated on pages 51–55. In addition, applicants must fulfill the following prerequisites to be considered for admission:

1. Be a graduate of an accredited school of nursing with an overall QPI of at least 2.00 or the equivalent
2. Be a licensed registered nurse in at least one state, U.S. trust territory, or the District of Columbia
3. Have a minimum of two years' experience in nursing practice in a hospital and/or ambulatory setting

Three letters of recommendation must be sent directly from evaluators; at least one from a supervisor. The remainder may be submitted by present or former instructors or by colleagues familiar with the applicant's experience in health care.

Preference will be given to applicants who show evidence of having made arrangements to be employed as a nurse practitioner upon completion of the program.

Scholarship Requirements

General scholarship requirements are stated on pages 70–71. Candidates for a Bachelor of Science degree who are majoring in the nurse practitioner program must achieve a cumulative QPI of 2.00, and a cumulative QPI of 2.50 in the core curriculum.

Advanced Standing

General provisions for advanced standing are listed on pages 54–55. In addition, students may receive up to 60 semester hours of advanced standing for successful completion of nursing school or courses in the physical, natural, or biological sciences, which are applied toward subject competence. In addition, earned credits from other institutions may be applied toward human competence requirements. Generally, advanced standing will not be granted for required courses in the major.

Residence Requirement

A minimum of 52 semester hours of course work in the major must be completed in residence in the School of Medicine and Health Sciences.

Degree Requirements

The satisfactory completion of a minimum of 122 semester hours is required for the degree of Bachelor of Science with a major in the nurse practitioner program. Course work is distributed as follows:

Human Competence—30 semester hours: 6 semester hours in English composition (Engl 9 or 10 and 11 or 12) and 24 semester hours in the humanities, social sciences, or mathematics (algebra, geometry, trigonometry, and calculus).

Subject Competence—40 semester hours of course work in the biological, physical, natural, and nursing sciences.

Vocational Competence—52 semester hours as follows:

Clinical Health Sciences—HCS 125,* 134,* 137, 140, 142, 143, 144, 145, 147, 193,* 199; Anat 115; Micr 128; Path 127, 128; Phar 158; Phyl 111.

Required Clinical Rotations—HCS 154,* 157,* 179.*

Students may petition to pursue additional elective clinical rotations selected from the following list: HCS 153, 165, 170, 171.

Applications

Application forms are available from the Nurse Practitioner Program, 2300 Eye Street, N.W., Himmelfarb 303, Washington, D.C. 20037, (202)676-4276, beginning in October. Completed applications should be returned to the Office of Admissions, George Washington University, 2121 Eye Street, N.W., Washington, D.C. 20052 no later than June 30.

Nursing Anesthesia Program

Admission to Degree Candidacy

The general requirements for admission to degree candidacy are stated on pages 51–55. In addition, candidates for the Bachelor of Science degree with a major in nursing anesthesia must fulfill the following prerequisites to be considered for admission:

1. Complete successfully high-school or college-level mathematics (general mathematics or algebra)
2. Complete successfully two semesters of college-level general chemistry (General Chem I and II)
3. Be graduates of a state-approved school of nursing; complete a minimum of 12 months of practical experience in critical-care nursing
4. Be a licensed registered nurse in at least one state, U.S. trust territory, or the District of Columbia
5. Satisfy the admissions requirements of the school of anesthesia at one of the affiliated hospitals prior to being admitted to the program at the George Washington University

Scholarship Requirements

Students must achieve a cumulative QPI of 2.50 in all nursing anesthesia courses taken in the first two semesters. Any student who does not maintain a 2.50 average may be required to take additional course work in order to obtain a minimum 2.50 average in the 30 hours of the core curriculum.

Advanced Standing

The general provisions for awarding of advanced standing are stated on pages 54–55. In addition, the following specific criteria in the area of subject

*A core curriculum course that must be completed with a cumulative QPI of 2.50.

competence apply to the Bachelor of Science degree with a major in nursing anesthesia:

1. Students who are graduates of two- or three-year nursing school programs and have had a minimum of 12 months of practical experience in critical-care nursing may receive up to 45 hours of advanced standing credit in nursing.
2. Students who have earned a B.S. degree in nursing may receive up to 60 hours of advanced standing credit in nursing.
3. Certified Registered Nurse Anesthetists (CRNAs) will receive credit for previous anesthesia work experience. CRNAs, however, must petition for waiver of the clinical requirement through satisfactory demonstration of clinical competence. Students seeking award of advanced standing credit on the basis of previous anesthesia work experience must demonstrate evidence of clinical competence.

Students who graduated from nursing school more than five years ago and have not been active in the nursing profession during the last five years may be required to take National League of Nursing or New York State Board of Regents examinations.

Residence Requirement

A minimum of 31 semester hours of course work in the major must be completed in residence in the School of Medicine and Health Sciences.

Degree Requirements

The satisfactory completion of a minimum of 121 semester hours is required for the Bachelor of Science degree with a major in nursing anesthesia. Course work is distributed as follows:

Human Competence—30 semester hours: 6 semester hours in English composition (Engl 9 or 10 and 11 or 12), 3 semester hours in psychology, and 21 semester hours in the humanities, social sciences, or mathematics (algebra, geometry, trigonometry, and calculus).

Subject Competence—30 semester hours of course work in the biological, physical, natural, and nursing sciences.

Vocational Competence—61 semester hours as follows:

Year 1: Phar 110, 111, 121, 122; Anes/Phar 191, 195; Anat 115; HCS 134; Phyl 111; Anes 198.

Year 2: Anes 193–94, 195–96.

All students must complete Year 1 (i.e., the core curriculum) in residence, with a minimum cumulative QPI of 2.50. CRNAs may petition to waive Year 2 of clinical course work on the basis of successful completion of Year 1 course work, demonstrated clinical competence, and satisfactory completion of an oral and/or written examination in the area of clinical anesthesia. The petition must be submitted to the Assistant Dean, through the program director, for approval.

Applications

Application information and forms are available from the Nursing Anesthesia Program, 2300 Eye Street, N.W., Washington, D.C. 20037, (202)676-3543. Completed applications must be returned no later than May 15.

Physician Assistant Program

The program leading to the degree of Bachelor of Science with a major in the physician assistant program is offered to on-campus students and off-campus military students and requires the satisfactory completion of 126 semester hours of course work.

Admission Requirements

The general requirements for admission to the program are stated on pages 51–55. In addition, applicants must submit evidence that they have satisfactorily completed a minimum of 30 semester hours of college credit, including two semesters of general chemistry, two semesters of psychology, and two semesters of biological sciences (the latter may include physiology, general biology, anatomy, microbiology, or zoology but not botany). Direct patient care experience is strongly preferred but not required. Three letters of recommendation, sent directly by evaluators, are also required as well as a personal interview (not applicable to off-campus military students).

Scholarship Requirements

Scholarship requirements are stated on pages 70–71. Candidates for the degree of Bachelor of Science with a major in the physician assistant program must maintain a cumulative QPI of 2.00 for course work completed in the physician assistant program. A cumulative QPI of 2.50 is required for the courses in the core curriculum (see below).

Students must successfully complete all courses for which they have registered in any one semester before advancing to the next semester (except students in the second year who have received an *IP* for work in progress). Failure to complete satisfactorily any part of the basic science curriculum may result in dismissal from the program. Students whose academic performance falls below average in any course may be required to take additional courses or to complete remedial work successfully before continuing in the program.

Residence Requirement

A minimum of 96 semester hours in the preclinical and clinical portions of the major must be completed in residence at the School of Medicine and Health Sciences.

Advanced Standing

Advanced standing does not apply to courses in the major; advanced standing toward the baccalaureate, however, may be awarded for appropriate course work completed previously at another academic institution with a minimum grade of *C*.

Degree Requirements

Satisfactory completion of a minimum of 126 semester hours is required of students (except off-campus military students) for the Bachelor of Science degree with a major in the physician assistant program. Course work is distributed as follows:

Human Competence—30 semester hours: 6 hours in English composition (Engl 9 or 10 and 11 or 12) and 24 hours of course work selected from the

humanities, social sciences, or mathematics (algebra, geometry, trigonometry, and calculus).

Subject and Vocational Competence—96 semester hours:

Basic Science Curriculum—Anat 115; Bioc 111; Micr 128; Path 127, 128, 152; Phyl 111.

Clinical Sciences—HCS 109, 125,* 134,* 140, 145, 146, 147, 148, 193; Phar 158.

Clinical Rotations—HCS 160,* 163,* 166, 169, 172,* 175,* 178, 198.

Clinical Electives—HCS 158, 159, 176, 177, 186, 187, 188, 199.

Other Required Courses—HCS 113, 116, 119, 137.

Remedial Courses—HCS 100, 103.

Off-Campus Military Students

The Bachelor of Science degree with a major in the physician assistant program is also offered to off-campus military personnel. Military students in the off-campus program must complete the following courses:

Human Competence—30 semester hours: 6 semester hours in English composition and 24 semester hours in the humanities and social sciences.

Subject and Vocational Competence—92 semester hours:

Basic Health Sciences—HCS 111, 120, 121, 151.*

Basic Clinical Sciences—HCS 109, 127,* 128,* 129,* 134,* 137, 146, 147, 148.

Clinical Clerkships—HCS 167,* 169, 172,* 174,* 189, 190, 191, 192, 195, 198.

Other Required Courses—A minimum of 30 semester hours of didactic course work must be completed in the areas of biological and physical sciences. This requirement will be satisfied by successful completion of Advanced Hospital Corps School (NEC 8425) or comparable course work.

Applications

Application forms for on-campus students are available from the Physician Assistant Program, 2300 Eye Street, N.W., Himmelfarb 307, Washington, D.C. 20037, (202)676-4034, beginning in September.

Radiologic Sciences and Administration Program

The program leading to the degree of Bachelor of Science with a major in radiologic sciences and administration requires the satisfactory completion of a minimum of 122 semester hours of course work. This program is designed for registered technologists in diagnostic radiologic technology, nuclear medicine technology, ultrasound, or radiation therapy technology who wish to continue their education at the baccalaureate level.

Admission to Degree Candidacy

The general requirements for admission to degree candidacy are stated on pages 51–55. In addition, students applying to the program must be registered technologists or registry-eligible within the first academic semester. Two

*Core curriculum course that must be completed with a cumulative QPI of 2.50.

letters of recommendation sent directly from previous instructors, advisors, or employers as well as a personal interview are required.

Advanced Standing

General provisions for advanced standing are listed on pages 54–55. In addition, students may receive up to 48 semester hours of advanced standing in subject competence under the following conditions:

1. If their technical training was completed within the last five years. The students, however, must have maintained a minimum QPI of at least 2.50 or an average of 80% from a program in radiologic technology, nuclear medicine technology, or radiation therapy (accredited by the Joint Review Committee on Educational Programs in Radiologic Technology, Nuclear Medicine Technology, or Radiation Therapy of the Council on Medical Education of the American Medical Association).
2. If they have been certified as an American Registered Technologist, Nuclear Medicine Technologist, or Radiation Therapy Technologist.
3. If they become registry-eligible during the first academic semester at George Washington University.

Scholarship Requirements

Scholarship requirements are stated on pages 70–71. Students must maintain a cumulative QPI of 2.50 in the core curriculum (i.e., all courses listed under *Subject and Vocational Competence*).

Residence Requirement

A minimum of 30 semester hours of course work in the major must be completed in residence at the School of Medicine and Health Sciences.

Degree Requirements

Human Competence—A minimum of 30 semester hours is required, including BAd 110, 191; Engl 9 or 10 and 11 or 12; Psyc 1; Soc 1; 6 hours of social sciences and 6 hours of humanities. Recommended electives include Engl 101; CSci 100; Psyc 144, 151; Soc 124, 129; CmTr 111, 121.

Subject and Vocational Competence—A total of 92 semester hours is required. Of these, a maximum of 48 semester hours is allowed for course work in an American Medical Association approved program in either diagnostic radiologic technology, nuclear medicine technology, or radiation therapy technology. The remaining 44 semester hours consist of the following required courses:

Radiologic Sciences—CpMd 101; Rad 130, 167, 171, 175, 190, 195.
Radiologic Administration—HSA 142, 153, 154, 170; Rad 140, 145
Electives—6 hours to be selected in consultation with faculty advisor.

Applications

Application forms are available from the Radiologic Allied Health Programs Office, 2300 Eye Street, N.W., Washington, D.C. 20037, (202)676-3650, and should be completed and returned no later than March 31 each year.

Required or Recommended Courses in Allied Health Programs Offered in Other Divisions of the University

Students should consult with their academic advisors on required courses for allied health students offered either by Columbian College of Arts and Sciences or by the School of Government and Business Administration. The program coordinators in the Office of Allied Health Administration will provide assistance in choosing electives appropriate for the student's particular program. These may be selected from a wide array of offerings in the humanities, mathematics, and social sciences. See the University's *Undergraduate and Graduate Programs Bulletin* for a complete list of course descriptions.

Off-campus military students should consult with the program coordinator for assistance in selecting electives and required courses at other institutions.



School of Medicine and Health Sciences Courses of Instruction

The School of Medicine and Health Sciences serves other divisions of the University by making available to nonmedical students certain undergraduate and graduate courses in the following departments: anatomy, biochemistry, microbiology, pathology, pharmacology, and physiology. The courses listed represent those offered as of July 1985 and are subject to change. The University reserves the right to withdraw any course announced.

Staff of Instruction

The staff of instruction listed by department at the back of this *Bulletin* is current as of March 1985.

Explanation of Course Numbers and Symbols

A number in parentheses after the name of the course indicates the number of semester hours of credit that may be earned. Five semester hours of credit per four-week elective period are granted for all fourth-year courses in the M.D. program.

Courses numbered 1–100 are for first- and second-year undergraduate allied health students. Courses numbered 101–200 are for third- and fourth-year undergraduate allied health students. Courses in the basic science departments numbered 201–400 are for candidates for the M.D. degree and for students in the Graduate School of Arts and Sciences. All other courses numbered 201–400 are primarily for candidates for the M.D. degree.

Key to Abbreviations

The following abbreviations are used for course designations.

Acct	Accountancy
AdSc	Administrative Sciences
AHA	Allied Health Administration
AM	Association Management
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
BAd	Business Administration
Bioc	Biochemistry
BiSc	Biological Sciences
Cart	Cartography
CE	Civil Engineering
CH&D	Child Health and Development
Chem	Chemistry
Chin	Chinese
Clas	Classics
ClEn	Clinical Engineering
CmTr	Communication and Theatre
CpMd	Computer Medicine
CSci	Computer Science
Derm	Dermatology
EAd	Engineering Administration
Econ	Economics
Educ	Education
EE	Electrical Engineering
EFL	English as a Foreign Language
EMed	Emergency Medicine
Engl	English
EngS	Engineering Science
EnHe	Environmental Health

Envr	Environmental Studies
EPol	Education Policy
E&RP	Environmental and Resource Policy
ForS	Forensic Sciences
Fren	French
Geog	Geography and Regional Science
Geol	Geology
Ger	Germanic Languages and Literatures
Gern	Gerontology
Gnet	Genetics
HCS	Health Care Sciences
Hist	History
HKLS	Human Kinetics and Leisure Studies
Hmn	Humanities
HSA	Health Services Administration
Idis	Interdisciplinary Courses
Ital	Italian
Japn	Japanese
Jour	Journalism
Kor	Korean
Law	Law
LEnf	Law Enforcement
Libr	Library
Math	Mathematics
ME	Mechanical Engineering
Med	Medicine
Mgt	Management Science
Micr	Microbiology
MStd	Museum Studies
Mus	Music
Neur	Neurology
NSc	Naval Science
NSur	Neurological Surgery
Ob&G	Obstetrics and Gynecology
Opht	Ophthalmology
OR	Operations Research
Orth	Orthopedic Surgery
PAd	Public Administration
Path	Pathology
Pchi	Psychiatry and Behavioral Sciences
PCm	Political Communications
Phar	Pharmacology
Phil	Philosophy
Phyl	Physiology
Phys	Physics
Port	Portuguese
PPol	Public Policy
PSc	Political Science
Psyc	Psychology
Rad	Radiology
Rel	Religion
RSci	Radiological Sciences
Slav	Slavic Languages and Literatures
SLP	Service Learning Program
Soc	Sociology
Span	Spanish
SpEd	Special Education
SpHr	Speech and Hearing
Stat	Statistics/Computer and Information Systems
Surg	Surgery
TCom	Telecommunications Policy
T&T	Travel and Tourism
Univ	University
Urol	Urology
U&RP	Urban and Regional Planning
WStu	Women's Studies

Allied Health Administration

Courses numbered 100–140 are open only to students in the Bachelor of Science degree program with a major in medical record administration.

100 **Readings in Health Record Science** (arr.) **Staff**
Assigned readings in health record science and related areas. Content differs based on individual student needs; may be repeated for credit. (Fall and spring)

120 **Problems in Organizing and Managing Health Information Systems** (6) **Staff**
(Formerly 5 credits)
Lecture (3 hours), laboratory (4 hours). Application of principles and prac-

tices in planning, designing, developing, evaluating, and managing health information systems in health care facilities and health agencies. Introduction to and application of instructional strategies and techniques as well as evaluation techniques to meet employee training needs. Prerequisite: completion of subject and human competence requirements. Staff

130 **Seminar: Organization and Management of Health Information Systems** (5)
Analysis and review of current practices in organizing and managing health information systems. Review of recent literature and current policy issues affecting the health care delivery system. Prerequisite: AHA 120. (Spring) Staff

131 **Quality Assurance/Risk Management in Health Care Services** (6)
Lecture (4 hours), laboratory (4 hours). Theory and application of quality assurance and risk management techniques for health information systems. Current methods applied in quality assurance programs in health care facilities, including concurrent and retrospective methodologies and multidisciplinary approaches. The effect of cash-per-case reimbursement and prospective payment systems on health information systems. Prerequisite: AHA 110 and completion of subject and human competence requirements. (Spring) Staff

132 **Computerized Health Information Systems** (3)
Automated data systems and their use in health information systems. Techniques used in evaluation of hardware and software components of computers for health information systems applications. Emphasis on data representation and manipulation in computers and on requirements and limitations of computer programming. Prerequisite: completion of human and subject competence requirements. Staff

140 **Management Practicum in Health Information Systems and Seminar** (12)
Supervised practical experience in health information systems management in various types of health care facilities. Prerequisite: Completion of subject, human, and all prior vocational competence requirements. (Summer, fall, and spring) Staff

175 **Health, Education, and Rehabilitation Networks** (3)
A survey of the roles and relationships of selected health care, special education, and rehabilitation services. Topics on current issues will include philosophical foundations, legislation, and societal concerns as they relate to the professions. Staff

199 **Independent Study** (3)
Required rotation in which the student determines the area of study with the approval of the faculty. Students are expected to develop learning objectives in conjunction with their faculty advisors. Evaluation of the student is based on completion of the learning objectives.

Anatomy

Chairman: R.S. Snell Staff

115 **Anatomy for New Health Practitioners** (4)
(Formerly 3 credits)
Gross and microscopic structure of human body, including musculoskeletal, nervous, endocrine, cardiovascular, respiratory, gastrointestinal, urinary,

and reproductive systems. Laboratory work is limited to prosected anatomical demonstrations.

202 **Gross Anatomy** (6) Snell and Staff
For graduate students. Regional dissections of adult cadaver supplemented with lectures and X-rays. Laboratory fee, $30. (Fall)

203 **Human Developmental Anatomy** (1) K. Johnson
For graduate students. Origin and development of human body; emphasis on value of embryology in interpreting anatomical anomalies. (Fall)

204 **Neuroanatomy** (2) T. Johnson
For graduate students. Gross and microscopic anatomy of central nervous system and special senses. Students who have received credit for Anat 204 may not register for Anat 212. Laboratory fee, $13. (Fall)

205 **Human Microscopic Anatomy** (3) Albert and Staff
For graduate students. Microscopic structure of cells, tissues, and organs of human body. Laboratory fee, $20. (Fall)

206 **Scanning Electron Microscopy** (2) Koering
For graduate students. Preparative techniques for various biological tissues, operation of scanning electron microscope, and interpretation of micrographs. Laboratory fee, $30. Enrollment limited. Prerequisite or concurrent registration: Anat 260. (Fall)

208 **Comparative Vertebrate Neurology** (1) T. Johnson
For graduate students. Survey of the evolution of the vertebrate brain. Prerequisite: Anat 204. Laboratory fee, $10. (Spring)

209 **Use of Audiovisual Techniques in Anatomy** (2) Allan
For graduate students. Preparation of a significant audiovisual program of some aspect of human anatomy. Laboratory fee, $20. (Spring)

212 **Neurobiology** (3) Staff
For graduate students. Same as Idis 212 and Phyl 212. Integrated survey of the structure and function of the human nervous system. Lecture, clinical demonstration, and laboratory. Laboratory fee, $25.

213 **Gross Anatomy** (6) Staff
Required for medical students. (Fall)

214 **Microscopic Anatomy** (3) Staff
Required for medical students. (Fall)

215 **Human Developmental Anatomy** (1) Staff
Required for medical students. (Fall)

221–22 **Seminar** (1–1) Staff
For graduate students. Research reports and discussions of special topics by guest lecturers, staff, and graduate students. Medical students encouraged to attend. (Academic year)

249 **Introduction to Anatomical Research** (1) Staff
For graduate students. Major research techniques as applied to biological materials in the various anatomical disciplines. (Fall)

252 **Physical Anthropology** (1) Angel
Variations in humans and factors affecting them, human evolution and racial differences, anatomy and culture of ancient humans. (Spring)

253 **Brain Tissue Interactions** (1) Walsh and Rosenstein
Lectures on interactions of the central nervous system with muscular, sensory, and endocrine systems. Student presentations and clinical aspects will be included. Prerequisite: Idis 212. (Spring)

254 **Fetal Anatomy** (2) Allan
Dissection of the midgestational human fetus. Comparison of fetal and adult

structures. 20 students. Laboratory fee for nonmedical students, $10 (Spring)

260 Electron Microscopy in Cellular Biology—Lecture (1) Bohr
Introduction to the morphology of the cell and its relationship to electron microscopic techniques. (Spring)

261 Electron Microscopy in Cellular Biology—Laboratory (3) Bohr
Introduction to the routine processing of specimens; preparation and interpretation of micrographs. Limited enrollment. Admission by permission of instructor. Prerequisite or concurrent registration: Anat 260. Laboratory fee $25. (Spring)

262 Gross Anatomy of the Upper and Lower Extremities (2) Snell and Staff
Detailed dissection, supplemented by X-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

264 Gross Anatomy of Head and Neck (2) Snell
Detailed dissection, supplemented by X-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

265 Clinical Cell Biology and Electron Microscopy (arr.) Albert
Investigation of clinical problems concerning microwave effects on the nervous system. 4-week elective periods. Snell

266 Gross Anatomy of Thorax and Abdomen (2)
Detailed dissection, supplemented by X-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

268 Gross Anatomy of Pelvis, Perineum, and Lower Extremities (2) Snell and Staff
Detailed dissection, supplemented by X-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

270 Dissection of the Human Brain (1) T. Johnson
Dissection of major pathways and nuclei of the brain with consideration of ventricular system; conferences and assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

272 Autonomic Nervous System (1) Allan
Development, microscopic and gross anatomy, function of central and peripheral components of autonomic nervous system. (Spring)

275 Advanced Human Embryology (2) Allan
Microscopic examination of the human embryo at several critical periods during embryogenesis. Prerequisite: Anat 203. Limited enrollment. (Spring)

276 Advanced Studies in Anatomy (1) Staff
Lectures and conferences on selected anatomical subspecialties—endocrinology, teratology, growth, etc. May be repeated for credit. (Spring)

279 Applied Regional Anatomy (arr.) Snell
Regional dissection, guided readings, weekly discussions. (Spring)

282 Advanced Neuroanatomy (arr.) T. Johnson, Staff
Dissection of the human brain, study of slides of the central nervous system and an introduction to neurological research.

284 Applied Surface Anatomy and Radiology (5) Snell
Detailed study of anatomical structures that are accessible to examination in

the living subject; normal radiology of the body. 4-week elective periods. (Spring)

288 **Surface Anatomy and Radiology** (1) Snell
Lectures and demonstrations on areas of clinical importance.

289 **Biochemical and Morphological Techniques in Cell Biology** (3) Slaby
Application of biochemical and electron micrographic techniques used in cell biology research. Limited enrollment. Approval of instructor required.

291 **Special Projects in Anatomy** (arr.) Snell
Independent study on any aspect of gross anatomy.

295 **Research** (arr.) Staff
Content differs each time course is offered; may be repeated once for credit. Fee to be arranged. (Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

501 **Didactic Anatomy** (3) Snell
Development of a didactic program to include human developmental anatomy, microscopic anatomy, gross anatomy, and where appropriate, neuroanatomy. Students may also develop interdepartmental opportunities. Topics may include anatomy of the special senses; functional morphology of the endocrine system; structure and functional anatomy of the mammary gland at different ages in both sexes; functional anatomy of the respiratory system, including a study of the bronchopulmonary segments; the urinary system; the heart; the autonomic nervous system; the lymphatic system; the female reproductive system; the male reproductive system; peripheral nerves and peripheral nerve lesions; functional anatomy of bones and joints; the pregnant uterus; the structural and functional anatomy of the stomach, duodenum, and colon. Limited enrollment.

800 **Summer Remedial: Gross Anatomy** (6) Snell

801 **Summer Remedial: Microscopic Anatomy** (3) Snell

802 **Summer Remedial: Human Developmental Anatomy** (1) Snell

Anesthesiology

Chairman: B.S. Epstein
Associate Chairman: J.E. Zimmerman *(Intensive Care Medicine)*

Courses numbered 190 through 198 are for nursing anesthesia students.

190 **Seminar: Anesthesiology** (4) Staff
Small discussion groups on morbidity and mortality from actual and reported cases. Topics related to complications of anesthesia.

191 Respiratory Care (3) Staff
Advanced techniques for the care of patients requiring total prolonged respiratory support. Same as Phar 191.

192 Orientation for Anesthesia (0) Staff
Lecture, group discussion, and audiovisual presentation. History of anesthesia, legal aspects, ethics, psychology, professional adjustments, department management, and organization.

193–94 Methods and Procedures in Anesthesia (2–2) Staff
At affiliated hospitals. Lecture, group discussion, and audiovisual presentation. Anesthesia techniques, positions in anesthesia, types of anesthetic required to meet the needs of different surgical specialties, and related topics.

195–96 Principles of Clinical Anesthesia (13–13) Staff
Twelve-month course at affiliated hospitals. Supervised clinical training and experience. The student is assigned patients, organizes and administers anesthesia, and follows the patients through their total hospitalization. Designed to satisfy the American Association of Nurse Anesthetists requirements.

197 Electronics for Medical Personnel (2) Staff
Introduction to fundamental principles used in electronic instrumentation for monitoring patient status in operating room and intensive care unit. Power, biomedical voltages and transducers, blood pressure and heart rate monitors, displays, telemetry, special-purpose instruments, and safety hazards analysis techniques for technical equipment procurement. Same as Phar 195. (Fall)

198 Pathological Physiology and Anesthesia (3) Staff
Review of pathophysiology of major organ systems in relation to anesthesia. Clinical implications of various disease states, their interactions with anesthetics, and effects on anesthetic management.

210 Anesthesiology Research Laboratory (5) Mergner
Participation in and observation of the various aspects of ongoing laboratory research in anesthesia, including surgery, physiology, pharmacology, and research techniques.

211 Diagnostic and Therapeutic Instrumentation (2) Shaffer
Introduction to diagnostic and therapeutic instrumentation used in critical care areas of the hospital, including the OR, ICU, CCU, and ICN. Methods of instrumentation operation, problems, and new developments.

212 Anesthesiology Research Laboratory (2) Mergner
Cardiovascular physiologic changes and measurements resulting from drugs, drug interactions, anesthetic techniques, etc. Placental transfer and fetal and maternal physiologic changes from toxic local anesthetic reactions. Limited enrollment. 2nd year only.

302 Required Anesthesiology (3) Morales and Staff
Required for senior students. Basic physiology and pharmacology as applied to cardiac, respiratory, obstetric, and renal changes incurred during anesthesia. Clinical application of these fundamentals discussed in class and demonstrated clinically.

380 Anesthesiology (5) Morales
Clinical experience in preoperative evaluation, surgical and obstetrical anesthesia, infant and adult resuscitation, inhalation therapy, and monitoring and blood gas determinations. 4-week elective periods. Univ. Hosp

382 Neurosurgical Anesthesia (arr.) Lee
Principles of clinical management of the neurologic patient in the perioperative period. Physiology and pharmacology of intracranial pressure and cerebral blood flow and metabolism. Somatosensory, visual and auditory

evoked response monitoring, intracranial pressure monitoring, and the effects of respiratory nursing and physiotherapy maneuvers on neurosurgical patients. Participation in research projects in operating room and intensive care unit may be possible. Univ. Hosp.

384 **Intensive Care Unit** (5) Zimmerman and Staff
Evaluation and management of respiratory failure, rationale and use of ventilators, airway management, cardiovascular support, and intensive care. 4-week elective periods. Univ. Hosp.

386 **Critical Care Medicine** (arr.) Rainey and Staff
Participation in managing patients with renal failure, shock, respiratory failure, acid–base disorders, and hyperalimentation. Emphasis is placed on appropriate use of invasive monitoring, intubation, and ventilatory support.

390–92 **Extramural Anesthesiology Elective** (arr.) Morales
The department arranges for students to spend elective periods at other institutions. Interested students should contact Dr. George Morales.

Biochemistry

Chairman: A.L. Goldstein

101 **Chemistry for Allied Health Science** (2) Staff
For allied health students. Basic concepts of general and organic chemistry. (Fall)

111 **Biochemistry for Allied Health Science** (4) Walker
(Formerly 3 credits)
For Allied Health students. Basic concepts of biochemistry and their relation to the allied health field. (Fall)

201 **Medical Biochemistry** (8) Walker and Staff
Required for medical students. Lecture and laboratory; emphasis on basic principles and their relation to medicine. (Fall)

205 **Biochemistry of Organ Function** (1) Kramer
For medical students; open to limited number of graduate students. Emphasis on biochemical processes unique to particular organ systems; application of these processes to evaluation of function. (Spring)

209 **Research Elective in Medical Biochemistry** (arr.) Walker
For senior medical students. Research in areas currently under investigation in the department. (Academic year)

221–22 **General Biochemistry** (3–4) Gallo and Staff
A comprehensive course in general biochemistry for graduate students in biomedical sciences and undergraduate students in biology and chemistry. Prerequisite: Chem 152, 154. (Academic year)

225–26 **Introduction to Biochemical Research** (arr.) Fiskum and Staff
Rotation through research projects in laboratory units within the Biochemistry Department to provide individualized in-depth training in the methods and instrumentation used in those units. Limited to students in the Department of Biochemistry graduate program. (Academic year)

227 **Biochemistry Seminar** (1) Bryant
Current literature in biochemistry. Open to graduate students in the biomedical sciences and to a limited number of medical students. May be repeated for credit. (Fall and spring)

229 **Biochemistry of Enzymes** (2) E. Anderson
Handling of enzymes, kinetics, reaction mechanisms, active site, isozymes, regulation, and other special topics. Prerequisite: Bioc 201 or 221. (Spring)

230 Current Topics in Enzymology (2) Bailey and Staff
For graduate students. Directed readings in various areas of enzymology. May be repeated for credit. Prerequisite: Bioc 229.

231 Bioenergetics (2) Staff
Laws of thermodynamics, application of these laws to biological systems, oxidation–reduction processes, and other special topics. Prerequisite: Bioc 221–22. (Fall)

232 Protein Chemistry (2) Steers and Schechter
Theory and methods of protein chemistry, structure–function relationship of proteins, and other special topics. Prerequisite: Bioc 201 or 221. (Fall)

240 Nutrition (2) Walker and Staff
Discussion of RDA, nitrogen-balance, vitamins and minerals, diets, and other special topics. Prerequisite: Bioc 201 or 221–22. (Spring)

241 Current Topics in Nutrition (2) Walker and Staff
Directed literature readings in various areas of nutrition. May be repeated for credit. Prerequisite: Bioc 240.

256 Biochemical Genetics and Inherited Metabolic Diseases (1) Merril
Biochemical aspects of genetics and contributions of molecular biology to understanding of human mutations and hereditary diseases. Prerequisite: Bioc 250. (Spring)

260 Lipids (2) Gallo and Vanderhoek
For graduate students. Biosynthesis, metabolism, functions of lipoproteins, prostaglandins, and other special topics. Prerequisite: Bioc 221–22. (Spring)

261 Current Topics in Lipids (2) Vahouny and Staff
For graduate students. Directed readings in the area of lipid biochemistry. May be repeated for credit. Prerequisite: Bioc 260.

263 Biochemistry of the Steroids (1) Dodek
For medical students; open to a limited number of graduate students. Basic chemistry of the steroids, pathways of biosynthesis and metabolism, regulatory mechanisms, physiologic effects, clinical measurement of endogenous steroids, clinical manifestations of steroid imbalance, steroid changes in pregnancy, and steroid therapy. Prerequisite: Bioc 201 or 221–22. (Spring)

264 Membrane-Associated Complex Lipids (1) Fishman
Catabolism and biosynthesis of complex sphingolipids, inherited metabolic diseases associated with malignant transformation, potential roles of gangliosides as membrane receptors for toxins and hormones, and aspects of membrane structure and biochemistry.

270 Biochemistry of the Immune Response (2) Goldstein and Staff
Immunoglobulin structure, function, and regulation; complement system; biochemistry of mediators of cellular immunity; molecular biology of the differentiation of the immune system. Prerequisite: Bioc 201 or 221–22 (Spring)

271 Current Topics in Immunology (2) Goldstein and Staff
For graduate students. Directed readings in the area of biochemical immunology. May be repeated for credit. Prerequisite: Bioc 270.

280 Biochemistry of Nerve Tissue (2) Moody and Staff
Molecular structure and function of nerve tissue, intra- and interneurons, communication mechanisms, biochemistry of various brain dysfunctions, and other special topics. Prerequisite: Bioc 201 or 221–22. (Fall)

290–91 **Extramural Biochemistry Elective** (arr.) **Walker**
The department arranges for students to spend one or more elective periods at other institutions.

295 **Research in Biochemistry** (arr.) **Staff**
Participation in a project under investigation in the department or one in a related field suggested by the student and approved by the staff. Content differs each time course is offered. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

501 **Readings in Human Nutrition** (arr.) **Staff**
For senior medical students. Directed readings in human nutrition. Review of basic concepts of nutrition and how to apply them to clinical situations. (Spring)

502 **Readings in Cell and Molecular Biology** (arr.) **Kumar**
For senior medical students. Directed readings on current research work in recombinant DNA and the application of gene cloning in the understanding of selected clinical disorders. Review of selected topics in molecular biology; basic concepts and possible application of cloned genes in clinical situations. (Fall and spring)

503 **Readings in Immunology** (3) **Goldstein**
Assigned readings in immunochemistry, immunobiology, tumor immunology, and basic and clinical cellular immunology. May be repeated for credit. (Spring)

800 **Summer Remedial: Biochemistry** (8)

Child Health and Development

Acting Chairman: L.P. Scott
Associate Chairmen: F.C. Green *(Child Health Advocacy)*, D.W. Delaney *(House Staff and Medical Care)*, A. Einhorn *(Pediatric Medicine)*, L.W. Greenberg *(Student Affairs)*, J.G. Randolph *(Surgical Division)*
Directors of Divisions: L.J. D'Angelo *(Adolescent Medicine)*, R.M. Sly *(Allergy)*, F.C. Green *(Ambulatory Medicine)*, R.S. Chandra *(Anatomical Pathology)*, W.A. McGill II *(Anesthesiology)*, L.P. Scott *(Cardiology)*, F.M. Midgley *(Cardiovascular Surgery)*, J.M. Hicks *(Clinical Laboratories)*, M.L. Elgart *(Dermatology)*, W. Hung *(Endocrinology)*, A.H. Einhorn *(General Medicine)*, S.L. Leikin *(Hematology)*, G.B. Avery *(Neonatology)*, E. Ruley *(Nephrology)*, S.A. Shelburne, Jr. *(Neurology)*, D. McCullough *(Neurosurgery)*, D.S. Friendly *(Ophthalmology)*, D.W. McKay *(Orthopaedic Surgery)*, K.M. Grundfast *(Otolaryngology)*, G. Eng *(Physical Medicine)*, M. Boyajian *(Plastic Surgery)*, J.H. Egan *(Psychiatry)*, W.J. McSweeney *(Radiology)*, J.G. Randolph *(General Surgery)*, A.B. Belman *(Urology)*

303 **Pediatric Clerkship** (10) **Greenberg**
Required for medical students. Full-time, as part of resident team; ward

rounds, work in outpatient department and specialty clinics under staff supervision; child phychiatry and child guidance, lectures, clinical conferences, grand rounds. Children's Hosp. (Annual, continuous 8-week rotation)

360 **Clinical Pediatrics Acting Internship: Adolescent Unit** (5) Einhorn
4-week elective periods. Children's Hosp.

361 **Clinical Pediatrics Acting Internship: Infectious Diseases** (5) Einhorn
4-week elective periods. Children's Hosp.

362 **Clinical Pediatrics Acting Internship: General Medicine** (5) Einhorn
Children aged 2 months–3 years. 4-week elective periods. Children's Hosp.

363 **Clinical Pediatrics Acting Internship: General Pediatrics** (5) Einhorn
Children aged 3 years–12 years. 4-week elective periods. Children's Hosp.

365 **Clinical Pediatrics Acting Internship: General Pediatrics** (5) Van Brakle
Ward and ambulatory services. Lectures, conferences, rounds, 4-week elective periods. Holy Cross Hosp.

366 **Mental Retardation** (arr.) Battle
Review of etiologic factors, clinical manifestations, seizures, disorders, therapeutic and preventive aspects, sociological problems, and restorative and rehabilitative approaches to chronic disease/disorder. Participation in a medical care delivery program and three educational programs for the retarded. Hosp. for Sick Children.

367 **Outpatient Pediatrics** (5) Einhorn
Elective in pediatrics as part of a resident team on an outpatient unit. Children's Hosp.

373 **Pediatric Urology** (arr.) Belman
Participation in clinical approaches on an inpatient and outpatient basis. Assessment, diagnostic evaluation, and participation in surgical problems. 4-week elective periods. Children's Hosp.

374 **Pediatric Orthopaedic Surgery** (5) Nason
4-week elective periods. Children's Hosp.

375 **Pediatric Surgery** (arr.) Randolph and Staff
Participation in closely supervised surgical service for infants and children, including newborn surgery and surgery for trauma and neoplasms. Children's Hosp.

376 **Pediatric Neurology** (5) Gale
Active participation in inpatient and outpatient management of children with a variety of neurologic disorders. Experience in the gamut of diagnostic procedures. Participation in regularly scheduled clinical rounds, conferences, and seminars is encouraged. Children's Hosp.

378 **Genetics** (5) Rosenbaum
Principles of basic human genetics with emphasis on the dysmorphic child, chromosomal aberrations, and genetic counseling. Opportunity to work in the genetic laboratory and to learn chromosomal techniques. 4-week elective periods. Children's Hosp.

379 **Pediatric Intensive Care** (arr.) Holbrook, Fields, Pollack, Zaritsky
Clinical and didactic material on the pathophysiology and treatment of life-threatening illnesses, conditions, or injuries in childhood. Carefully supervised patient responsibility. Children's Hosp.

380 **Development Disabilities** (arr.) **Battle**
Theoretical issues of development, clinical appraisal, and intervention strategies for disability in vision, audition, motor functions, cognition, language, feeling, and affective development. Following an intensive review of normal development in all areas. Weekly reading assignments, written projects, and tutorial discussion sessions. Hosp. for Sick Children.

381 **Pediatric Allergy and Immunology** (5) **Sly, Josephs**
Introduction to pediatric allergy and clinical immunology; clinics and wards. Some experience in experimental techniques, pulmonary function testing, and objective methods of clinical evaluation. Children's Hosp.

382 **Pediatric Radiology** (arr.) **McSweeney and Staff**
Participation in conferences and observation in the department; conventional and newer nonconventional body imaging techniques are stressed in problem solving in pediatric medicine. Children's Hosp.

383 **Pulmonary Medicine** (arr.) **Fink, Murphy**
Introduction to SIDS and sleep APNEA program, pulmonary function testing, and fiberoptic bronschoscopy. Detailed diagnostic and therapeutic procedures, including pulmonary and nutritional manifestations and complications in cystic fibrosis patients, from newborns to those in their third decade. Medical, surgical, psychological, and social problems of cystic fibrosis patients and their families. Children's Hosp.

386 **Pediatric Hematology/Oncology** (5) **Dinndorf and Staff**
Clinical course on the diagnosis and management of children with hematologic and oncologic diseases. Laboratory experiences, including examination of peripheral blood smears and bone marrow aspirates and interpretation of laboratory tests used in the diagnosis and management of these patients. 4-week elective periods. Children's Hosp.

387 **The Chronically Ill Child and Family in the Community** (arr.) **Battle**
Emphasis on care provided children with chronic illnesses (both long-term problems and family aspects) in the hospital and in the community. Introduction to the health team concept and preparation to serve as members, leaders, and consultants on an interdisciplinary health care team. Contact with nurses, allied health professionals, and other team members. Focus on the biosocial aspects of care. Emphasis on improving the function of children with chronic illness rather than on specific diseases. Hosp. for Sick Children.

388 **Newborn Medicine** (arr.) **Avery and Staff**
Observation and participation in the intensive care of infants. 4-week elective periods. Children's Hosp.

389 **Pediatric Cardiology** (5) **Scott and Staff**
Physical diagnosis of congenital and acquired heart diseases, interpretation of electrocardiograms and vectorcardiograms, cardiac catheterizations. 4-week elective periods. Children's Hosp.

390–95 **Extramural Pediatric Elective** (arr.)
The department makes arrangements for students to spend elective periods at other institutions. Interested students should contact Dr. Arnold Einhorn. Program must be approved by the Department, the student's advisor, and the Dean's Office.

396 **Approach to Care of Child with Handicapping Conditions** (arr.) **Battle**
Multidisciplinary approach to care of children with multiple handicaps, developmental delay, and/or chronic illness, in clinical assessments, therapy sessions, and interdisciplinary conferences. Reaction and behavior of the child, family, and staff are explored. Weekly reading assignment, written projects, and tutorial discussion sessions. Hosp. for Sick Children.

397 **Pediatric Nephrology** (arr.) Bock and Staff
Emphasis on clinical pediatric nephrology of inpatients and outpatients. Opportunities for evaluation of new referrals for renal problems and the management of known renal disease in children in both inpatient and outpatient settings. Research opportunities are available in immunologic causes of renal disease, complement abnormalities, vitamin D metabolism, acid base physiology, and renal physiology, but clinical aspects of the program are stressed. Children's Hosp.

399 **Ambulatory Adolescent Medicine** (5) Silber and Staff
Outpatient clinic experience in diagnosis and management of adolescent problems, under supervision of senior staff and fellows. Participation in consultative clinics, multidisciplinary interviewing conferences, medical teaching conferences, Adolescent Grand Rounds, and twice-weekly conferences with director of outpatient management and department chairman. Children's Hosp.

400 **Pediatric Laboratory Medicine** (arr.) Hicks and Staff
Laboratory studies of infants and children correlated with clinical disease. In-depth review of laboratory diagnostic studies. 4-week elective periods. Children's Hosp.

401 **Pediatric Otolaryngology** (5) Grundfast and Staff
Otoscopic examination of infants and children; management of common middle-ear disorders; evaluation of stridor and airway compromise. Children's Hosp.

403 **Pediatric Rehabilitation** (arr.) Koch and Staff
Exposure to acute and chronic disabling disorders in infants and children. The student is expected to learn normal neuromuscular development and physical examination, with emphasis on posture and movement. Exposure to electrodiagnostic techniques and the use of non-M.D. therapists in rehabilitation. Observation of pathologic states referred for treatment, including the prescription of braces and adaptive equipment. Children's Hosp.

404 **Being an Effective Teacher** (3) Greenberg
Theory of problem solving, learning of preference styles, and interpersonal skills and the way in which they affect teaching. Students assess their own teaching and learning styles, are assigned independent readings, and view videotapes to assess teaching effectiveness. Children's Hosp. Ref

405 **Sports Medicine for Children** (5)
Orthopaedic sports medicine in children. Outpatient exposure to diagnostic and treatment methods. Operating room exposure to surgical treatments. Exposure to pediatric orthopaedics. Clinical research in sports medicine is available. Children's Hosp.

Computer Medicine

Chairman: W.S. Yamamoto

101 **Practical Computing for New Health Practitioners** (3) Orthner
For students majoring in radiologic science and administration. Familiarization with computer systems, basic terminology, applications programming, and I/O equipment.

201 **Theory of Medicine** (1) Yamamoto
Inquiry into the theoretical constructs implicit in the practice of medicine, with emphasis on decision theory. Other topics include the nature, origin, and organization of medical knowledge, with a focus on statistical reasoning.

252 **Introduction to Interactive Computing (1)** Orthner
Introduction to the Massachusetts General Hospital Medical Utility Programming System (MUMPS) programming environment and data base management system, which allows nonprogrammers to design, establish, and operate interactive data bases that are useful for many research projects.

253 **Medical Computing (1)** Yamamoto
Aspects of computer use, including preparation and execution of programs that involve clinical or research applications, such as ECG analysis, pulmonary function calculation, medical file management, mathematical modeling, data processing, and managerial computing.

353 **Medical Computing (arr.)** Yamamoto, Orthner
Aspects of computer use, including preparation and execution of programs that involve clinical or research applications such as ECG analysis, pulmonary function calculation, medical file management, mathematical modeling, data processing, and managerial computing. In most cases the instructor tutors a student in computation applied to a medical topic. The course consists of classroom or laboratory instruction only if two or more students enroll. Students interested in MUMPS are instructed in a separate section.

354 **Automated Medical Measurement Systems (5)** Yamamoto
Students work under supervision in a multiphasic screening clinic and participate in the process of new implementations and in evaluation of the system. Seminar discussions related to clinical practice, preventive medicine, and occupational medicine. 4-week elective periods. Warwick Bldg.

390–91 **Extramural Computer Medicine Elective (arr.)**
The department sponsors fourth-year students spending one or more elective periods at other institutions. Programs must have the prior approval of the department staff.

502 **Mathematical Models and Decision Theory (3)** Yamamoto
Systematic review of mathematical and computational approaches to medical decision analysis and representations of biomedical information. The models will deal with physiological systems in heuristic and decision algorithms and with formulation of medical information for automated diagnosis and prognosis. Students should have some interest or experience in probability and differential equations and will be expected to complete a project involving computers. Warwick Bldg.

Dermatology

Chairman: M.L. Elgart

380 **Dermatology Clinic (5)** Elgart and Staff
Conferences, lectures, and attendance at dermatology clinic where patients with wide variety of dermatoses are seen. Diagnosis and treatment of common skin disorders, dermatologic surgical procedures, technique for using liquid nitrogen, culture and identification of fungi, microscopic diagnosis of common cutaneous diseases. 4-week elective periods. Med. Fac. Assoc.

381 **Dermatology Clinic (5)** Mitchell
Same as Derm 380. 4-week elective periods. Group Health.

382 **Dermatology Clinic (5)** Rodman and Staff
Same as Derm 380. 4-week elective periods. Walter Reed Army Med. Ctr.

383 **Dermatology Clinic (arr.)** McCarthy, Ruggles
Same as Derm 380. 4-week elective periods. Andrews AFB Hosp.

385 **Dermatology in General Medicine** (arr.) Nigra
Intensive learning experience in dermatology. Outpatient clinic two morn-
ings a week. Daily rounds on the inpatient and consultation services.
Consultations on all patients in hospital. One basic science conference each
week. Minimum of three hours of Kodachrome dermatology review slide
sessions each week. Advanced reading in dermatology will be scheduled.
Supervision by chief resident. Washington Hosp. Center.

386 **Private Office Practices** (arr.) Elgart
Dr. Elgart will arrange with various private dermatologists for students to
work in a private dermatology office.

390–92 **Extramural Dermatology Elective** (arr.)
The department may arrange for students to spend one or more elective
periods at other institutions. Interested students should contact the chair-
man of the department.

Emergency Medicine

Acting Chairman: M.S. Smith

10 **Introduction to Prehospital Clinical Medicine** (5) Staff
Explores, through lectures and laboratory simulation experiences, the role
and responsibilities of the emergency medical technician ambulance (EMT
A). Patient assessment, basic life support, hemorrhage control, bandaging,
splinting, and extrication techniques. Observation of emergency care deliv-
ery in a local setting. Certification training in cardiopulmonary resuscita-
tion. Upon successful completion, the student is eligible to take the national
registry EMT/A examination.

11 **Anatomy and Physiology for Prehospital Clinicians I** (4) Staff
Structure and function of selected anatomical parts and systems of the
human body. Emphasis on head, neck, and chest regions and cardiovascular,
respiratory, endocrine, and central nervous systems. Postmortem examina-
tions highlight areas of particular relevance to the emergency medical
technician.

12 **Anatomy and Physiology for Prehospital Clinicians II** (4) Staff
Continuation of EMed 11. Emphasis on abdominal region and urogenital and
musculoskeletal systems. Prerequisite: EMed 11.

50 **Arrhythmia Recognition for Emergency Clinicians** (1) Staff
Fundamentals of electrocardiography and interpretation of basic ECG pat-
terns. Common errors in taking and reading ECGs, with emphasis on
identification of common normal and abnormal wave patterns, and the effects
of drugs and electrolyte imbalance upon ECG patterns.

60 **Topics in Emergency Pharmacology and Toxicology** (3) Staff
Overview of pharmacologic agents commonly used in the prehospital setting
to manage cardiac, respiratory, medical, and traumatic emergencies. Review
of assessment and management of cases involving selected poisons and illicit
drugs.

61 **Prehospital Advanced Life Support I** (5) Staff
Role and responsibilities of the emergency medical technician/paramedic,
including medical history and physical assessment techniques, pathophysiol-
ogy, and management of shock, cardiac, respiratory, neurological, and
abdominal emergencies. Overview of emergency medical services communi-
cation systems. Students are assigned to work in local emergency depart-

ment settings and ride with area paramedics. Laboratory sessions in patient assessment, advanced airway management, defibrillation, intravenous techniques, and IM/SQ injections. Prerequisite: EMed 10; EMed 11, 12, and 50 or concurrent registration.

62 **Prehospital Advanced Life Support II** (5) Staff
Assessment and management of emergencies (not covered in EMed 61) in obstetrics, gynecology, trauma, pediatrics, adolescent medicine, and geriatrics. Prerequisite: EMed 10, 11, 12, 50, 60, and 61.

64 **Psychosocial Emergencies** (3) Staff
Effective handling of patients, including those experiencing emotional crisis, the elderly, the physically impaired, and children. Includes specific crises, such as child and spouse abuse, sexual assault, suicide, drug abuse, and death and dying.

65 **Prehospital Clinical Practicum** (4) Staff
Students rotate through a variety of clinical sites, including critical care units, a poison control center, crisis management center, labor and delivery suite, emergency department, and operating room. Satisfies the American Heart Association's Advanced Life Support Provider's Course requirements. Prerequisite: EMed 60, 61, and 62. EMed 64 is strongly recommended.

110 **Topics in Administrative Communication Skills** (3) Staff
Effective report writing, record keeping, oral presentation skills, and communication with physically impaired or non-English-speaking patients.

115 **Emergency Medical Services Management Information Systems** (3) Staff
Introduction to the use and application of microcomputers in emergency medical services through presentation of basic programming concepts. Includes a national survey and comparison of computer-assisted systems, use of microcomputers in inventory control, performance evaluation, and resource allocation.

118 **Emergency Medical Services and the Health Care Industry** (3) Staff
The organization and management of emergency medical services systems in the United States. Topics include service delivery methods, the relationship of emergency medical services to the overall health care system, the responsibility of the public and private sectors in the delivery of emergency care, and the role of federal, state, and local authorities.

120 **Emergency Medical Services Communication System Design** (3) Staff
Introduction to communication network concepts in the emergency medical services system, including communication systems design, dispatch protocols, triage, and procedures for multiple casualty incidents.

122 **Educational Planning and Assessment for Emergency Medical Services Administrators I** (3) Staff
Theories and principles of learning and teaching processes, including the development of effective course objectives and lecture outlines.

124 **Management of Emergency Medical Services Resources** (3) Staff
Principles of personnel management and basic human processes that contribute to the functioning of organizations; discussion of manpower training, utilization, resource allocation, vehicular design, and equipment purchase.

126 **Clinical Update in Emergency Medicine** (3) Staff
State-of-the-art management of typical and atypical clinical problems, such as cardiopulmonary resuscitation, multiple trauma, head injury, infectious diseases, poisoning, and overdose.

127 Prehospital Field Experience (2) Staff
Fieldwork in prehospital or emergency department service. Classroom discussion highlights appropriate clinical management techniques through selected case studies.

131 Issues in Prehospital Emergency Medicine (3) Staff
Current concepts and controversies in prehospital care delivery, including use of medical protocols, role of the medical community in supervision and training, and prehospital certification and recertification criteria. Benefits and risks of performing advanced technical procedures, such as endotracheal intubation, chest decompression, cricotracheotomy, and central line placement in the field setting.

133 Educational Planning and Assessment for Emergency Medical Services Administrators II (3) Staff
Development of effective presentation styles as well as test writing and performance-evaluation techniques, through presenting lectures, preparing examinations, and evaluating test results. Prerequisite: EMed 122.

134 Mental Health and the Emergency Clinician (3) Staff
The impact of stress and burnout on emergency medical personnel. Includes recognition, causes, and effects of stress symptoms as well as short-term stress counseling techniques.

136 Financial Management in Emergency Medical Services (3) Staff
The fundamentals of budgeting and financial management, with emphasis on budget development, financial resource allocation, management, and block grant procurement. Prerequisite: Acct 51, Stat 51.

140 Emergency Medical Services Systems Analysis (3) Staff
Basic principles and methods of planning and evaluation in emergency medical services. Various analytical models are used to examine the currently recognized components of an emergency medical services system. Methods for evaluating prehospital care services and determining their impact on patient outcomes. Prerequisite: HSA 170.

150 Disaster and Multiple Casualty Planning (2) De Atley
Management of multiple casualty incidents in prehospital and hospital environments, including development of mass casualty response plans, principles of triage, medical evaluation procedures, communication protocols, and the role of the command physician.

160 Medicolegal Aspects of Emergency Medical Services (2) Staff
Examination of a variety of medicolegal issues in the delivery of emergency medical services, including abandonment, malpractice, negligence, patient consent, the Freedom of Information and Privacy Acts, the Good Samaritan law, protocol deviation, record keeping, patient refusal of services, and medical control. Emergency medicine legislation and recent court decisions.

170 Practicum: Prehospital Clinical Medicine (3) Staff
Fieldwork in prehospital emergency care service as a member of a fire department rescue squad or private ambulance company. Formal case reviews include discussion of patient problems and highlight pertinent lessons in clinical management.

180 Emergency Medical Services Incident Command (3) Staff
The principles of incident command as they pertain to emergency medical services incidents, including size up, single- and multiple-unit operations, integration with other health care and federal agencies, transfer of authority, mutual aid, and regional response plans. Simulation experiences.

181 Extrication and Rescue Techniques (4) Staff
Techniques used in gaining access to and evacuating the injured. Vehicular accident extrication, highrise and water rescue, electrical emergencies, and use of ropes.

182 **Public Education and Media Relations for Emergency Medical Services Personnel** (3) Staff
The role of the media in relation to emergency medical services explored through classroom discussion with media representatives; advantages and disadvantages of media coverage; methodologies for public education about emergency medical services.

183 **Medical Control** (3) De Atley
The role and responsibilities of the control hospital and the command physician. Methods of evaluating medical protocols, personal performance, and impact on health care.

184 **Emergency Medical Services Response to Hazardous Materials Incidents** (3) De Atley
Hazardous materials and their risks for emergency medical services and for the community; identification of hazardous materials and related problems, precautions to be used when approaching the contaminated patient, and patient management following exposure to selected hazards.

185 **Emergency Medical Services Research Design and Presentation** (3) Staff
Compares basic principles and methods used in emergency medical services research. Data collection, analytical (including quantitative) methods, and reporting techniques. A research project is required. Prerequisite: EMed 118.

190 **Seminar: Advanced Topics in Emergency Medical Services Administration** (2) Staff
Managerial issues, such as labor relations, unions, and collective bargaining; contract negotiations; medical and community relations, personnel development, and motivation techniques.

199 **Independent Study** (3) Staff
An individual research project in an area relevant to emergency medicine. For seniors with permission of program faculty.

200 **Emergency Medical Services Administrative Internship** (12) De Atley
The student is assigned to a local emergency medical service agency as an administrative intern to assist in the administration of its health care delivery program; an opportunity to evaluate ongoing health care service delivery and to devise protocols and regulations consistent with service needs.

201 **Cardiopulmonary Resuscitation Practicum** (0) De Atley, Shesser
Designed to teach the mechanical skills providing basic life support. Upon successful completion of this course, student receives certification from the American Heart Association in Basic Life Support. The course complements cognitive skills learned in EMed 230.

230 **Emergency Medicine I** (2) Kline, De Atley
Required course for first-year medical students. Didactic presentations by guest speakers on general principles in the prehospital care and handling of victims of accident and illness. Emphasis on prehospital management of typical emergencies. Patient assessment, cardiopulmonary resuscitation, bandaging and splinting, lifts and carries, intravenous therapy and parenteral drug administration. Opportunities to practice psychomotor skills and rescue techniques during regularly scheduled practicum sessions. (Spring)

231 **Emergency Medicine II** (1) Chen, De Atley
Elective continuation of EMed 230. The student is expected to develop proficiency equivalent to that of an emergency medical technician. Opportunities to spend time in the University Emergency Room and ride on either a basic life support ambulance or a mobile intensive care unit with the instructor. After successful completion of Emergency Medicine I and II, the

student is awarded an Emergency Medical Technician certificate by the University.

302 Emergency Medicine (3) — Shesser and Staff
Required for senior students. Rotating clinical shifts in the emergency unit of the George Washington University Medical Center under the supervision of the faculty and residents of the Department of Emergency Medicine. There will be a video-taped series of lectures, daily student conferences, and a required reading syllabus.

310 Emergency Medicine at Washington Hospital Center (5) — Rosenthal, Brown
A four-week elective in emergency medicine in the urban community hospital setting. Participation in relevant conferences at Washington Hospital Center and the weekly Emergency Medicine Grand Rounds series. Prerequisite: EMed 302.

311 Emergency Medicine at Holy Cross Hospital (arr.) — Chen, Shuster
A four-week elective in emergency medicine in the suburban community hospital setting. Participation in relevant conferences at Holy Cross and the weekly Emergency Medicine Grand Rounds series. Prerequisite: EMed 302.

312 Emergency Medicine Elective at George Washington (5) — Smith
A four-week elective for the student interested in Emergency Medicine as a career. The student will be assigned a faculty preceptor and will combine clinical experience with a research or administrative project. Prerequisite: EMed 302.

320 Comparative Emergency Medical Services Systems (3) — Adams, Shesser
Time will be divided between EMS systems in the District of Columbia, Montgomery County, and Fairfax County. The student will accompany prehospital advanced life support providers. Required reading list. A short written report on a prehospital care topic is required.

330 Clinical Toxicology (5) — Turbiak and Staff
Under supervision, students work in the National Capital Poison Control Center located at Georgetown University Hospital. Students answer telephone calls from the public and medical community requesting information. There will also be a series of seminar-style conferences.

340 Research Elective in Emergency Medicine (5) — Rosenthal
Participation in ongoing research activities of the Division of Emergency Medicine.

350 Wound Management (arr.) — Walls
Wound care, including preparation, cleansing, debridement, anesthesia, repair, dressings, splints and after-care instruction, under the supervision of Emergency Department staff.

390–93 Extramural Emergency Medicine (arr.) — Shesser
The department will allow selected students to spend elective periods at other institutions.

Health Care Sciences

Chairman: J.E. Ott

Courses numbered from 10 through 96 are limited to military personnel in off-campus health sciences programs. — Staff

10 Anatomy and Physiology (3)
Study of the human body; esteology, arthrology, myology, hematology,

immunology; circulatory, respiratory, digestive, endocrine, excretory, nervous, and reproductive systems.

11 **Applied Anatomy and Physiology** (4) Staff
Application of anatomical and physiological principles. Control of hemorrhage, methods of resuscitation, management of shock, relief of pain; physical examination, nutrition, fluid and electrolyte balance, respiratory conditions, childbirth.

12 **Mathematics for Health Providers** (2) Staff
Provides a basis for understanding the equations used to calculate the effect of undersea pressure on the human body and the information necessary to apply these calculations to appropriate therapy, such as drug dosage and other modes of treatment.

15 **Pharmacology and Toxicology** (arr.) Staff
Medicinal substances used in treating people: pharmaceutical mathematics, terminology, preparations, compounding, physiological action and potential toxic reactions of certain drugs, legal aspects of drug regulations.

16 **Clinical Laboratory Techniques and Procedures** (3) Staff
Laboratory procedures used in basic health maintenance. Use of microscope, complete blood count, acid-fast stain, urinalysis, blood sedimentation rate, RPR card test, coagulation and bleeding time, blood grouping, blood typing.

20 **Radiation Biology** (2) Staff
Effects of ionizing radiation on various cells, tissues, organs, and the human body as an integrated unit. Organic and inorganic molecules; the human immune system; possible genetic effects and long- and short-term effects of radiation. History and use of radiation therapy, including therapy modalities, classification of neoplasms, types of therapy units, and treatments.

21 **Health Physics** (4) Staff
Concepts of radioactivity, including beta decay, isometric transmissions, electron capture, internal transition, alpha decay, the auger effect, isotopic half-life, secular and transient equilibrium, artificial transmutations, nuclear reactions, and counting of statistics.

22 **Introduction to Epidemiology** (1) Staff
Study of common communicable diseases, immunologic factors, and procedures. Contact interviewing and reporting of the communicable diseases.

25 **Management of Medical and Surgical Emergencies** (7) Staff
Basic techniques used in treating effects of life-threatening situations. Clinical procedures taught include cardiopulmonary resuscitation, hemorrhage control, minor surgical procedures, and venous cutdowns. Dealing with drug overdose and treatment of acute medical problems.

26 **Medical Diagnosis and Treatment** (11) Staff
Introduction to the recognition of clinical disease states and determining the diagnostic techniques best equipped to provide relevant data in a cost-effective manner; emphasis on advanced technology. Review of therapeutic approaches.

54 **Techniques in Cardiac Resuscitation** (2) Staff
A two-part course, designed to teach basic cardiac life-support techniques and skills needed in basic life-support instruction training.

66 **Radiologic Fundamentals and Radiation Health** (6) Staff
Basic concepts used in diagnosis of disease using radiologic equipment. Commonly used positions, degrees of X-ray penetration, protective measures for patients and technologists. Safety techniques; acceptable units of radiation exposure. Review of N.R.C. regulations, accountability, records, receipt of materials and storage.

67 Disaster Sanitation (3) Staff
Survey of nuclear, biological, and chemical hazards; emphasis on detection, personnel protection, and related functions.

68 Environmental Sanitation (1) Staff
Study of certain environmental factors that contribute to human health. Food, water, living and working spaces, economics, and pest control.

75 Dental Fundamentals (2) Staff
Includes screening dental records, providing oral examinations, identifying radiographs, administering anesthesia, and providing dental, endodontal and periodontal treatment.

83 Alcohol and Drug Abuse (2) Staff
Includes types and magnitude of substance abuse, ethical and medical issues, impact on the family, and treatment.

87 Surface Radiation Health (3) Staff
Provides background data on sources of radiation and radiation services and programs available in the Navy.

90 Occupational/Environmental Health (5) Staff
Basic concepts of environmental hazards, such as chemical and industrial exposure, and how to prevent and treat exposure to toxic substances. On-site evaluations of safety hazards and unsafe practices in the workplace.

92 Medical Material Management (4) Staff
Material management in the medical facility. Budget and budgeting process, expense operating budget, purchasing, material receipt and inspection, inventory of equipment and supplies, controlled medicinals, stock record cards, surveys and adjustments, classes of plant property, property accountability, storage requirements.

93 Health Systems Administration I (arr.) Staff
Health systems organization. General office procedures, basic typing methods, standard subject identification codes, filing procedures, records disposal, security of patient information, correspondence, procedural manuals.

94 Health Systems Administration II (4) Staff
Planning office systems, procedures, environment, and location. Quality control, work measurement methods, authority and organizational relationships, principles of office organization, employee supervision.

95 Records Management (6) Staff
Public health records management. Classification of personnel, personnel records, promotions, educational services, career development, personnel orientation, medical care eligibility, patient data systems, statistical analysis.

96 Clinical Experience (10) Staff
Supervised experience and research. Application of didactically learned principles to the practical situation.

100 Clinical Medicine Review (5) Staff
For physician assistant students who have failed to meet the required minimum cumulative QPI average in the core curriculum by the end of the clinical year. Students may petition to take this additional rotation on a one-time-only basis; the rotation will be specifically tailored to meet individual student needs, if permission is granted.

101 Environmental Biostatistics (3) Staff
Statistical reasoning, collection of data, rates, incidence, and prevalence. Generalization of observations and use of measurement data. For off-campus students.

102 Food and Water Sanitation (3)
General characteristics of urban and rural water systems: treatment and

distribution, public bathing place sanitation, design and function of water treatment facilities. Dairy products and food sanitation: processing, storing, and distributing food; supervision and training of food industry personnel.

103 **Academic Curriculum Tutorial** (arr.) **Staff**
For physician assistant students who have failed to meet the requirement of satisfactory performance in one or more subject areas in the first-year curriculum. Students must petition to take this course on a one-time basis only; the course will be specifically tailored to meet individual student needs if permission is granted.

109 **Human Behavior I** (2) **Stein**
Prepares student to enter clinical work with a practical knowledge of psychiatry. Mental status examination as a tool of clinical assessment. Development of a basic approach to understanding and working with psychiatric patients. (Fall)

113 **Preventive Health and Epidemiology for Physician Assistants** (2) **Cawley**
Focuses on psychosocial issues that will affect the student as a physician assistant, including abortion, depression, patient education, suicide, stress, and crisis intervention. Reviews such issues as certification, professional practice, legislation, reimbursement, and malpractice. Prerequisite: HCS 119. (Spring)

116 **Medical Terminology** (0) **Stein**
Autotutorial completed before entering program. Terminology and vocabulary basic to all areas of medical science, hospital service, and allied health specialties.

119 **The Physician Assistant Role in Modern Health Care** (2) **Cawley**
Facilitates student's development in the role of physician assistant. Encourages development of communication skills necessary to enhance the humanistic practice of medicine

120 **Biochemistry for Allied Health Sciences** (2) **Staff**
Same as Bioc 111. For off-campus students.

121 **Microbiology for New Health Practitioners** (2) **Staff**
(Same as Micr 128)
For off-campus students. Lecture course for students in Allied Health program. Basic concepts of microbiology and principles of microbial defense. Study of microorganisms of medical importance.

122 **Public Health Microbiology** (3)
General applied concepts of microbiology, fundamental immunologic concepts, general principles of virology, development of a surveillance protocol for nosocomial infection. For off-campus students.

125 **Manifestations of Disease** (5) Johnson, Stein
Interdisciplinary course that presents the theory of medicine using an organ system approach. Presents clinical findings and pathophysiology for a wide spectrum of diseases. Medical and surgical subspecialties present state-of-the-art information on the diagnosis and management of diseases. Prerequisite: Anat 115; Phyl 111. Open to graduate students with permission of instructor.

126 **Clinical Approach to Diagnosis** (arr.) **Staff**
Equips the student with the basic skills necessary to recognize clinical symptoms and signs needed to arrive at an informed provisional diagnosis. For off-campus students.

127 **Clinical Medicine I** (arr.) **Staff**
Provides the student with an introduction to the recognition of the clinical disease state. An intradisciplinary format allows the student to integrate

learning through the use of acquired knowledge in the basic sciences. For off-campus students.

128 Clinical Medicine II (arr.) Staff
Continuation of Clinical Medicine I with emphasis on advanced technology used in diagnosis and complete review of the therapeutic approach. Prerequisite: HCS 127. For off-campus students.

131 Human Behavior II (2) Staff
Continuation of HCS 109. Prerequisite: HCS 109. (Spring)

133 Introduction to Clinical Assessment (arr.) Staff
Clinical interviewing and physical examination. Designed to permit the student to achieve a beginner's level of clinical competence. For off-campus students.

134 Clinical Assessment (arr.) Staff
Provides the student with the necessary information and opportunity to refine and practice skills in patient interviewing and physical examination. Provides the student with the abilities necessary to integrate data obtained from the newer and more sophisticated modes of diagnostic technology. (Fall)

135 Nuclear Submarine Radiation Health (17) Staff
Students learn to apply principles of applied mathematics, atomic theory, nuclear weapons management, radiation health administration, radiation biology, and health physics in the fulfillment of their duties aboard a nuclear submarine.

136 Nuclear Submarine Medicine (7) Staff
Students learn how to perform routine administrative functions, conduct routine medical tests, handle medical and surgical emergencies, apply preventive medicine concepts, conduct training programs, and apply principles of atmospheric control in a nuclear submarine setting.

137 Issues in Health Care (1) Povar
Focuses on the interface between the individual practitioner-patient interaction and the various forces of society that have a major impact on the practitioner and the patient. The contribution of law, ethics, economics, and government to the health care system will be introduced in lectures and panel discussions and illustrated with case reports. For off-campus students.

140 Clinical–Pathological Correlation (2) Povar
Introduction to medical problem solving via case presentations. Student learns to correlate pathophysiology with symptom manifestation. The course emphasizes interpretation of historical and physical findings, laboratory data, and radiographic studies pertinent to the disease under discussion and examines the rationale for particular drug therapies, including an understanding of side-effects and dosage selection. Open to graduate students with permission of instructor.

142 Nurse Practitioner Seminar I (3) Johnson
Role resocialization and current issues influencing development of the nurse practitioner role. History-taking and communication skills are a major focus.

143 Nurse Practitioner Seminar II (2) Johnson
Continuation of HCS 142.

144 Nurse Practitioner Seminar III (3) Johnson
Continuation of HCS 142 and 143.

145 Topics in Pediatrics (1) Stein
Lecture series on pediatrics in the primary care setting: growth and development, child safety, common respiratory infections, asthma, abdominal disorders, and other topics.

146 **Topics in Emergency Medicine for Physician Assistants** (1) Staff
Students learn the principles of recognizing, evaluating, and treating the patient with an urgent or emergent problem. Review of signs and symptoms, accompanying physical findings, and methods for diagnosis and treatment of a spectrum of emergent illnesses. The laboratory portion of the course prepares students for the clinical skills or procedures they will perform in their clinical year, including suturing, gowning and gloving, CPR and ACLS certification, cast application, intubation, and catheterization.

147 **Introduction to Radiology** (1) Stein
Emphasizes principles and language of radiologic imaging, as well as radiologic anatomy. Students begin to develop a systematic approach to radiology and an ability to distinguish normal from abnormal radiological findings.

148 **Introduction to Electrocardiography** (1) Stein
Fundamentals of electrocardiography and interpretation of basic ECG patterns are stressed. Common errors in taking and reading ECGs are examined. The identification of common normal and abnormal wave patterns is emphasized by reviewing ECGs taken by the students and others. Information about the effects of drugs and electrolyte imbalance on ECG patterns.

153 **Gynecology Outpatient: Nurse Practitioner** (arr.) Staff
Required rotation for nurse practitioner students. Management of gynecological problems in ambulatory setting.

154 **Clinical Geriatrics** (arr.) Staff
Required rotation for nurse practitioner students. With guidance and approval of advisor, students develop individual study and learning objectives.

157 **Primary Care Preceptorship: Nurse Practitioner** (arr.) Staff
Six-week required rotation for nurse practitioner students. All aspects of patient management in ambulatory setting.

158 **Cardiothoracic Medicine Elective for Physician Assistants** (4) Staff
Elective four-week clinical rotation selected with faculty approval. The student will be exposed to patient care problems commonly seen in this specialty area and will learn to recognize, collect, and integrate information on patients under the supervision of the preceptor.

159 **Dermatology Elective for Physician Assistants** (4) Staff
Elective four-week clinical rotation selected with faculty approval. The student will be exposed to patient care problems commonly seen in this specialty area and will learn to recognize, collect, and integrate information on patients under the supervision of the preceptor.

160 **Medical Inpatient** (5) Alexander
Six-week rotation in which the student learns to recognize, collect, and integrate information regarding the medical problems of a patient who has been admitted to the hospital. The student is part of a medical team under the supervision of the medical resident or attending physician. Students are on a regular call status. Attendance is required at all work rounds, lectures, and conferences.

163 **Medical Outpatient** (5) Alexander
Six-week rotation in which the student learns to recognize, collect, and integrate information regarding the various medical problems encountered in the ambulatory setting. Takes place in a primary care setting such as an outpatient clinic, an HMO, or a community health center. Emphasis on differential diagnosis, patient management, and preventive medicine. Students function as part of the health care team under a physician's supervision.

165 Medical Outpatient: Nurse Practitioner (arr.) Staff
Rotation for nurse practitioner students, arranged with approval of advisor. Aspects of specialty patient management in ambulatory setting.

166 Surgical Inpatient (5) Alexander
Six-week rotation in which the student learns to recognize, collect, and integrate information relating to the admitted surgical patient. In-depth experience in the pre- and post-operative management of the surgical patient. Students assist during operative and ward procedures and function as part of the surgical team under a physician's supervision.

167 Surgical and Emergency Medicine (arr.) Staff
Same as HCS 178 except that length of course is variable. For off-campus students.

169 Obstetrics and Gynecology (5) Alexander
Six-week rotation in which the student learns to recognize, collect, and integrate information regarding the obstetrical and gynecological patient. Exposure to outpatient gynecological problems and inpatient obstetrical practice. Students act as part of the obstetrical/gynecological health care team under a physician's supervision.

170 Obstetrics and Gynecology: Nurse Practitioner (arr.) Staff
Two-week elective rotation for nurse practitioner students. With guidance and approval of advisor, students develop individual study and learning objectives.

171 Pediatric Outpatient: Nurse Practitioner (arr.) Staff
Elective rotation for nurse practitioner students. Ambulatory pediatric practice.

172 Pediatric Outpatient (5) Alexander
Six-week rotation in which the student learns to recognize, collect, and integrate information about the medical problems of the pediatric outpatient. Takes place in a pediatric ambulatory setting under the direction of a pediatrician. Normal growth and development, pediatric history and physical examination, and management of common pediatric illnesses are some of the selected topics.

174 Primary Care (5) Staff
Required rotation for off-campus allied health students. All aspects of primary care medicine. Hospital rounds with attending physicians.

175 Primary Care Preceptorship (arr.) Staff
Eight-week experience in which the student performs much as a graduate physician assistant in a primary care setting. Appropriate primary care areas include pediatrics, internal medicine, family practice, and emergency medicine.

176 Emergency Medicine Elective for Physician Assistants (4) Alexander
Elective four-week clinical rotation selected with faculty approval. The student will be exposed to patient care problems commonly seen in this specialty area and will learn to recognize, collect, and integrate information on patients under the supervision of the preceptor.

177 General Medicine Elective for Physician Assistants (4) Alexander
Elective four-week clinical rotation selected with faculty approval. The student will be exposed to patient care problems commonly seen in this specialty area and will learn to recognize, collect, and integrate information on patients under the supervision of the preceptor.

178 Emergency Medicine (5) Alexander
Six-week rotation in which the student learns to recognize, collect, and

integrate information about the emergency patient. Takes place in an emergency room department in which the student is exposed to the variety of emergency situations through rotating shifts. The student performs as part of the emergency medical team under the supervision of an emergency room physician.

179 **Emergency Medicine: Nurse Practitioner** (arr.) Staff
Rotation for nurse practitioner students. Medical and surgical emergency management problems.

180 **Practicum in Environmental Health** (arr.) Staff
Supervised fieldwork. Food service, housing, water, sewage and solid waste, and infectious diseases. Occupational health problems. Reports and conferences.

181–82 **Introduction to Environmental Science** (3–3) Staff
Water: general characteristics (urban and rural), treatment and distribution, public bathing place sanitation, design and function of water treatment facilities. Recognition and control of environmental pollution. Treatment and disposal of human wastes. Food sanitation: processing, storage, and distribution. Effects of major pollutants on people. Radiological safety. For off-campus students.

183 **Introduction to Industrial Hygiene** (3) Staff
Chemical hazards: diseases caused by chemical exposure, toxic dust, metal fumes and vapor, gases and organic compounds. Physical hazards: biological effects of low and high temperatures, radiation (electromagnetic, ultraviolet, ionizing), illumination, sound, pressure, and atmospheric pollution. For off-campus students.

184 **Public Health Organization and Administration** (3) Staff
Public health activities, organization, philosophy, background, and development. Vital statistics, laboratory services, education, nursing, and social services. Administrative considerations, including governmental aspects, fiscal management, personnel factors, and public relations in public health organizations. For off-campus students.

185 **Environmental Impact and the Law** (3) Staff
The rationale for environmental impact statements from the viewpoint of the nature and origins of the environmental crisis. Government agencies responsible for environmental impact statements, current statutes and regulations pertaining to the environment. For off-campus students.

186 **Orthopedics Elective for Physician Assistants** (4) Alexander
Elective four-week clinical rotation selected with faculty approval. The student will be exposed to patient care problems commonly seen in this specialty area and will learn to recognize, collect, and integrate information on patients under the supervision of the preceptor.

187 **Radiology Elective for Physician Assistants** (4) Alexander
Elective four-week clinical rotation selected with faculty approval. The student will be exposed to patient care problems commonly seen in this specialty area and will learn to recognize, collect, and integrate information on patients under the supervision of the preceptor.

188 **Shock Trauma Elective for Physician Assistants** (4) Alexander
Elective four-week clinical rotation selected with faculty approval. The student will be exposed to patient care problems commonly seen in this specialty area and will learn to recognize, collect, and integrate information on patients under the supervision of the preceptor.

189 **Alcohol Rehabilitation Unit** (3) Staff
Psychological and therapeutic approaches to care and rehabilitation of patients with alcohol-related disturbances. For off-campus students.

190 Dermatology (1) Staff
Clinical assessment of common dermatologic conditions found in the ambulatory care setting. For off-campus students.

191 Eye, Ear, Nose, and Throat (3) Staff
Diagnostic and therapeutic approaches to determining the outcomes of disease of the eyes, ears, nose, and throat. For off-campus students.

192 Orthopaedics (3) Staff
Diagnosis and treatment of common orthopaedic problems found in the primary care setting. For off-campus students.

193 Clinical Aspects of Aging (2) Johnson
Common clinical problems of the elderly. Discussion of the demography, etiology, pathophysiology, diagnostics, and management of select problems. Health maintenance concepts. Issues concerning health policy and the aged.

194 Practicum in Gerontology and Geriatric Care (arr.) Staff
Supervised fieldwork with the elderly or in administration and planning for the elderly. Offered in cooperation with other schools and departments of the University. For medical students and for undergraduate and graduate students in the social sciences and Health Services Administration.

195 Ophthalmology (2) Staff
Recognizing and managing common ophthalmologic problems; performing thorough ophthalmologic exams (excluding refraction); and providing routine care of the eye. For off-campus students.

196 Issues in American Health Care (arr.) Povar
Fieldwork combined with academic study of the present American health care system and its problems: cost, quality of care, delivery of care, ethical issues, health education, consumer issues. Field placements (12–20 hours per week) in appropriate health-related activities. Admission by permission of instructor. Undergraduate students only. (Fall and spring)

197 Current Topics in Bioethics (1) Staff
Critical investigation of various problematic areas of bioethics. Designed and presented by an all-campus faculty group that includes physicians, lawyers, economists, philosophers, and health care administrators.

198 Psychiatry (4) Alexander
Four-week rotation in which the student learns to recognize, collect, and integrate information regarding the psychiatric patient. The student is part of the therapeutic community and is exposed to the identification, treatment, and therapy of the psychiatric patient.

199 Independent Study (arr.) Staff
Required rotation in which the student determines the area of study with the approval of the faculty. Students are expected to develop learning objectives in conjunction with their faculty advisors. Evaluation of the student is based on completion of the learning objectives.

201 Practicum in Geriatric Care (1) Pawlson
Clinical experience will include interviewing elderly persons (initial assessment), observation of medical history taking and physical assessment, and participation in a multidisciplinary case conference. (Fall and spring)

203 Death and Dying (1) Lynn
Seminar, films, lectures, required readings. Possible topics include dying children, suicide and suicide survivors, hospice and care of the terminally ill, the right to die.

232 Studying a Study: Methods for Reading the Medical Literature (1) Riegelman
Required course for first-year medical students. Principles of analyzing medical journal articles with application to actual clinical articles. Lectures

and seminars stress nonmathematical epidemiology and biostatistical principles with multiple illustrations of errors that can occur in research articles.

233 **Epidemiology and Medical Decision Making** (1) Riegelman
Required course for second-year medical students. Principles of epidemiology and of diagnostic testing will be presented. Rates of disease, assessment of risk and disease causation, and concepts of reproducibility, range of normal, sensitivity, and specificity will be studied. Epidemiology will be approached using case studies. Medical decision making will include an introduction to diagnostic decision analysis.

301 **Clerkship in Primary Care** (8) Staff
Required for third-year medical students. Care of patients in ambulatory setting. Includes participation in University's prepaid health plan (HMO), emergency room, and office practice of general internists, general pediatricians, and family practitioners. Emphasis on specialty skills that contribute to physician's capacity to care for common minor illnesses. Office practice of orthopaedics, otolaryngology, dermatology, and ophthalmology. Participation with District of Columbia Fire Department in responding to ambulance calls. Lecture series provides foundation for office management of common illnesses in ambulatory setting. 6-week elective periods throughout the academic year.

350 **Ambulatory Health Care** (arr.) Pawlson
Research or clinical experience in primary medical care, including geriatric medicine. Participation in project relating to health care delivery, including medical audit, study of organization of health services, and problems of underserved (especially elderly) populations. Clinical experience will be arranged. Exchange with similar program in other institutions is possible, especially for those participating in model family practice units.

361 **Family Practice Preceptorship** (arr.) Pawlson
Family practice preceptorship in rural Garrett County, Md. Supervision is by board-certified family practitioners in the Garrett County Medical Center. The physicians are affiliated with the University of Maryland Family Practice Program, of which this site is a part.

362 **Rural Family Practice Preceptorship** (arr.) Pawlson
Family health care in a small coal mining town in central West Virginia. The Somersville Hospital Family Practice Center includes facilities for outpatient, inpatient, and emergency services. Supervision is by three board-certified family practitioners. 4-week elective periods.

363 **Geriatric Medicine** (arr.) Pawlson and Staff
Clinical experience at a congregate housing facility, outpatient practice, hospital home visits, and a long-term facility; opportunity to supplement experience with activity at senior centers and day care facilities.

369 **Issues in Health Care** (1) Povar
Overview of important issues in health care. Lectures focus on broad issues, such as the organization of health care and the role of different professions in the U.S., and on the individual concerns of the patient. Course explores the patient–practitioner relationship and the legal and ethical problems of medical practice. Individual and group projects, seminar discussions, and panel presentations by patients. Required for second-year medical students. (Fall)

390–94 **Extramural Health Care Sciences Elective** (arr.)
Students may arrange to spend elective periods in community medicine, emergency medicine, or family medicine at other institutions. Approval of the department chairman is required.

400 **Medical Decision Making** (2) Riegelman
Required course for all M.D. students. Principles necessary for understanding new diseases, new diagnostic technology, and new therapies. Case

examples illustrating clinical applications. Principles of decision analysis, cost–benefit analysis, technology assessment, and preventive medicine issues. Applications of computers to clinical care.

502 **Organization and Financing of Health Care in the United States** (3) Birnbaum
Structural and financial policies and forces shaping the current health care delivery milieu in the United States. Students review current issues reflected in the media to arrive at personal solutions or proposals based on consideration of existing financial and structural characteristics. Emphasis is on the organizational provider, although the role of the individual provider is also addressed. Significant reading is required.

504 **Medical Law for the Attending Physician** (3) Fiscina, Connors
Discussion of how the law attempts to define societal expectations for a physician's professional conduct under varying clinical circumstances. Highlighting of medicolegal landmarks and demonstration of the process used in the judicial system to analyze and measure the reasonableness of professional conduct. Clinicolegal case studies.

505 **Biomedical Ethics** (5) Lynn and Associated Faculty
An intensive course in ethics offered cooperatively with the medical schools at the Georgetown, Howard, and Uniformed Services Universities. Subjects will be chosen from areas of current tension for the medical professions, including delineation of the physician and patient roles, informed consent, research issues, issues in death and dying, genetic counseling, practitioner's social responsibility, allocation of scarce resources, and federal health policy. Lectures, films, reading time, and discussion.

Interdisciplinary Courses

First-year medical students are required to take Idis 212, *Neurobiology*, administered by the Departments of Anatomy and Physiology.

Staff

212 **Neurobiology** (3)
Same as Anat 212 and Phyl 212. Integrated survey of the structure and function of the human nervous system; lecture, clinical demonstration, and laboratory.

Introduction to Clinical Sciences, an interdisciplinary program, is required of medical students in the second year. By means of lectures, panel discussions, seminars, case presentations, demonstrations, and examinations of patients, it provides students with basic instruction in various clinical subjects and prepares them professionally and personally for the clinical clerkships and career electives in the third and fourth years. The program is under the direction of a Coordinating Committee appointed by the Dean for Academic Affairs of the School of Medicine and Health Sciences and formulated by the Second Year Subcommittee of the Educational Planning Committee. The Coordinating Committee consists of representatives from the departments responsible for teaching courses in the program and medical students: Department of Psychiatry and Behavioral Sciences, Department of Pathology, Department of Health Care Sciences, Department of Medicine, Office of Education, and Department of Pharmacology, plus one second-year student and one third-year student. In addition to Idis 301 (see below), the program consists of Path 201, Phar 201, Phar 202, HCS 137, and Pchi 201.

301 **Introduction to Clinical Medicine** (16) **Staff**
One-year course. Integrated, organ-oriented course, with emphasis on physical diagnosis. Fundamental instruction in child health and development, clinical problem solving, dermatology, gynecology, internal medicine (including subspecialties), neurology, obstetrics, ophthalmology, psychiatry, radiology, and urology; hospital-based physical diagnosis and history-taking experience.

800 **Summer Remedial: Clinical Medicine** (16)

801 **Summer Remedial: Neurobiology** (3)

Medicine

Chairman: J.C. Rios
Directors of Divisions: A.M. Ross *(Cardiology)*, K.L. Becker *(Endocrinology and Metabolic Diseases)*, H. Fromm *(Gastroenterology)*, L.S. Lessin *(Hematology and Oncology)*, C.U. Tuazon *(Infectious Diseases)*, K. Wipplinger *(Internal Medicine)*, S.V. Spagnolo *(Pulmonary Diseases and Allergy)*, P.H. White *(Rehabilitation Medicine and Rheumatology)*

201 **Diagnostic Studies in Clinical Medicine** (1) **Scott**
Combination of didactic sessions concerning physiopathology and its correlation to laboratory studies, practical sessions, and case problems as they relate to the utilization of laboratory and other diagnostic procedures, with emphasis on decision making. Second-year students only.

250 **Introduction to Occupational and Environmental Medicine** (2) **Chase**
Health effects of various occupational and environmental hazards and pollutants discussed from several perspectives, including basic research, federal regulation, labor/management, and physician. Health effects of radiation, air and water pollution, toxic substances, and environmental extremes.

305 **Inpatient Clerkship** (10) **Staff**
Required for medical students. Comprehensive study of patients; history and physical examination; ward rounds, consultations, conferences, preceptorial teaching, seminars. V.A. and Univ. Hosps.; Wash. Hosp. Center. (8-week periods throughout academic year)

331 **Acting Internship in Medicine (Hematology–Oncology)** (arr.) **Spiegel and Staff**
Assignment to a ward team dealing exclusively with oncologic problems. Many patients will be on chemotherapy protocols; all will be seriously ill and in need of considerable special attention. Special conferences and regular house staff conferences. Students take night call with the ward team and are expected to function at the level of interns on the team. 4-week periods. Univ. Hosp.

332 **Acting Internship in Medicine** (5) **Spiegel**
Assignment to a ward team. Responsibility for completing initial patient evaluation and diagnostic and therapeutic plans, writing all medical orders (which must be countersigned by an M.D.), coordinating patient's care, writing progress notes, and dictating discharge summary. Night call with the ward; supervision by team resident.

333 **Acting Internship in Medicine** (5) **Curtin**
Under the supervision of the medical resident and attending physician, student works with a patient-care team on a medical ward, does initial

evaluation, and presents patient's problem at attending rounds and appropriate teaching conferences. Subspecialty consultants review patient's problem with student. 4-week elective periods. Wash. Hosp. Center.

334 **Acting Internship in Medicine** (5) O'Connell
Assignment to a patient-care team under direct supervision of a University resident on general medical wards. Problem-Oriented Medical Record System used. Students complete initial patient evaluation data base; are responsible for clinical management during hospitalization; write all orders which must be reviewed and cosigned by the resident; and present their patients at attending rounds and conferences. Close supervision and guidance by the team resident, attending physician, and subspecialty consultants. 4-week elective periods. V.A. Hosp.

335 **Acting Internship in Medicine** (arr.) Wisneski
Academically oriented acting internship in a community hospital setting. Emphasis on basic clinical medicine. Responsibilities of intern. Holy Cross Hosp.

336 **Intensive Care Medicine** (5) Schwab and Staff
Student works on Intensive Care Unit with intern-like duties, including night call. 4-week elective periods. Wash. Hosp. Center.

337 **Senior Clerkship in Medicine** (5) Weiss and Associated Faculty
Assignment to a ward team that includes a medical resident and attending physician. Students will be assigned patients. Responsibility for completing an initial medical evaluation and diagnostic and therapeutic plans and for writing all orders (countersigned by an M.D.). Night call approximately every third night. Attending Rounds conducted by practicing physicians, either full or part time, will be held three times per week. Students will be expected to attend the daily AM Report and the daily Noon Conference. Providence Hosp.

338 **Occupational and Environmental Medicine** (arr.) Chase
Assignment to Washington Occupational Health Associates, where the effects of various occupational and environmental health hazards are addressed. Participation in clinical intervention, under physician's supervision. Emphasis on relationship of occupational and environmental medicine to practice of primary care. Travel opportunity to distant field sites is generally available.

348 **Infectious Disease** (5) Longfield and Staff
Patients with a variety of infectious diseases are seen and evaluated in conjunction with an infectious disease Fellow and attending physician. Designed to provide experience in consulting on ambulatory and hospitalized patients with various documented or potential infectious illnesses. Natl Naval Med. Ctr.

349 **Infectious Disease** (5) Levy, Curtin
Clinical experience on infectious disease service. Daily work rounds, including lab, conferences, journal club. 4-week elective periods. Wash. Hosp Center.

350 **Infectious Disease** (arr.) Parker and Staff
Introduction to the diagnosis and treatment of bacterial, viral, fungal, and mycobacterial infections. Students assume primary responsibility for infectious disease consultations in conjunction with Fellows, residents, and full-time faculty members. Clinical application of laboratory techniques used in the diagnosis and treatment of patients with infectious disease problems. Emphasis on the usefulness of rapid diagnostic techniques and pharmacology of antimicrobics. Students participate fully in all section activities. 4-week elective periods. V.A. Hosp.

351 **Infectious Disease** (arr.) — Tuazon and Staff
Clinically relevant aspects of microbiology and immunology; relevant aspects of patient history, physical, and laboratory examination. Students learn to do quality infectious disease consultations and how to use antibiotics intelligently.

352 **Cardiology** (5) — Hsu
Designed to provide experience in ambulatory and hospitalized patient care, ECGs, graphics, CCU, exercise lab; observation in cath. lab. 4-week elective periods.

354 **Preceptorship in Cardiology** (5) — Ross
Placement with an affiliated Washington-area practicing cardiologist. Exposure to office and hospital cardiology and electrocardiography.

356 **Cardiovascular Diseases** (arr.) — Haider, Meyer, Rasul
Students participate in two clinical arenas: (1) nonemergent cardiac problems and (2) routine problems and their diagnostic evaluation. Rounds three times weekly; weekly teaching conferences with members of the Cardiology staff. Later assignment to a 12-bed critical-care unit that includes coronary patients and medical–surgical patients with intensive-care problems. Student works with a senior resident and works up patients admitted to these units. Daily rounds with teaching physicians. Student assists in the care of critically ill patients and those with suspected myocardial infarction or cardiac arrhythmias. Exposure to invasive monitoring and therapeutic techniques.

358 **Cardiology—Washington Hospital Center** (5) — Lindsay and Staff
Active participation in the clinical cardiology service of Washington Hospital Center. Bedside evaluation correlated with electrocardiography and other diagnostic studies, including stress testing, phonocardiography, echocardiography, cardiac catheterization, and nuclide angiography. 4-week elective periods.

359 **Coronary Care Unit—Washington Hospital Center** (5) — Mendelson
Active participation in the care of patients on the Coronary Care Unit of Washington Hospital Center. Student works closely with house staff and attending staff. Emphasis on diagnosis and treatment of coronary disease, complications of infarction, diagnosis and treatment of arrhythmias, and selection of patients for surgical intervention. 4-week elective periods.

360 **Cardiology** (5) — Fletcher* and Staff
Experience in clinical cardiovascular problems under supervision of cardiology staff. Emphasis on history, physical diagnosis, and noninvasive cardiovascular techniques. Role of cardiac catheterization explained and results in specific cases discussed. Electrocardiography covered as one of the tools used to approach the cardiovascular patient. Patient management is integral part of course. Teaching rounds and conferences. 4-week elective periods. V.A. Hosp.

361 **Cardiology—NIH** (arr.) — Cannon, Leon
Broad exposure to all aspects of congenital and acquired cardiac disease. Participation in diagnostic and therapeutic work-up of patients and evaluation of acute and long-term effects of medical and surgical interventions through discussions, research conferences, etc.

362 **Cardiac Catheterization** (arr.) — Pichard, Lindsay
The student will see two patients undergoing catheterization. Students interview and examine patients before catheterization, analyze the noninvasive data available, and present patient to the catheterization team. Observation of the performance of catheterization, participation in the analysis of

*Dr. Fletcher is Chief of Cardiology at the Veterans Administration Hospital.

hemodynamic and angiographic data, and discussion of the physiologic and pathologic processes involved and the therapy applicable to the case.

363 Medical Intensive Care and Coronary Care Unit—V.A. Hospital (5) — Arabian and Staff

Evaluation and management of acute medical illness, including myocardial infarction; severe heart failure; cardiac dysrhythmia; respiratory, renal, and hepatic failure; GI bleeding; and acid-base and fluid-electrolyte disturbances. Procedures and devices used on the unit, including cardioversion, temporary and permanent cardiac pacemakers, right heart and arterial catheterization, intraaortic balloon counterpulsation, invasive and noninvasive electrophysiologic study, mechanical ventilators, and oxygen therapy. Students take call every third night with a medical resident and intern.

370 Endocrinology (arr.) — El-Khodary

Assignment as an acting intern to work with a second- or third-year resident. Admit and work up patients. Consultations of the General Medical Service on patients with endocrine problems. Daily rounds and weekly teaching conference to discuss endocrine problems in depth. Opportunity to attend teaching duties at D.C. General Hospital. In-depth evaluation of patients with endocrine problems; emergency care of patients admitted to medical floors and Intensive Care Unit for serious life-threatening endocrine emergencies.

371 Endocrinology (5) — Gaskin and Staff

Evaluation of patients referred to the endocrinology service, participation in planning diagnostic work-ups and therapy, and responsibility for case presentations and follow-up of those patients. Daily clinical rounds and weekly endocrine clinic and diabetic clinic. Weekly endocrine conference includes journal club once a month and pediatric endocrinology once a month. Rounds and conferences at the V.A. and G.W. Hospitals when possible. Daily review of assigned reading. 4-week elective periods. Wash. Hosp. Center.

372 Endocrinology and Diabetes (arr.) — Ratner and Staff

Clinical experience in endocrinology and metabolism; emphasis on outpatient care of diabetes mellitus with longitudinal follow-up. Students examine patients and participate in the diagnosis and planning of therapy. Daily rounds, weekly diabetic pregnancy clinic, didactic lectures, and case discussions. Univ. Hosp.

373 Endocrinology and Metabolism (arr.) — Becker and Staff

Clinical experience in endocrinology and metabolism. Students examine endocrine patients, make preliminary diagnoses, and assist in treatment. Daily clinical rounds; weekly endocrine clinic, diabetic clinic, and journal club; case discussions; didactic lectures. Twice-weekly endocrine reviews based on assigned reading. V.A. Hosp.

375 Endocrinology Research (arr.) — Becker

Participation in endocrinology and metabolism research laboratory. Introduction to chemical and technical aspects of endocrine research. Participation in ongoing research activities. Students learn appropriate procedures, such as radioimmunoassay of hormones, histopathologic techniques, atomic absorption spectrophotometry, and investigative approach to solving research problems. Prior interview with instructor.

390–95 Extramural Internal Medicine Elective (arr.)

The department will permit students to spend elective periods at other institutions. Interested students should contact Dr. Spiegel.

399 Medicine Consult Service (5) — Spiegel

Assignment to a resident who takes requests for consultations with the Department of Medicine from other GWU Hospital services. Initially this service will be reserved for students who need to repeat third-year medicine

experiences. Later in the year, it may be available for students looking for a medicine experience, particularly oriented toward patients on other services of the hospital.

402 **Practicum in Immunologic Techniques** (arr.) — Hollinshead and Staff
Methodology and/or application of hybridomamonoclonal antibodies techniques, both human-human and mouse-mouse. Other monitoring procedures will be taught, such as enzyme-linked immunoassays, procedures for extraction of antigenic pieces, and monoclonal antibody-derived epitopes.

403 **Oncology** (arr.) — Cohen
Participation in clinical management of patients with carcinoma on the oncology ward. Methods of clinical research are stressed. V.A. Hosp.

404 **Medical Oncology** (arr.) — Young
Current methods of evaluation and treatment of lymphomas, Hodgkin's disease, testicular tumors, ovarian, breast, and other malignancies, including a view of the broad spectrum of these diseases. Participation in patient care and review of clinical trials. Procedures such as bone marrows, liver biopsies, and other staging techniques. Each student will be assigned to work closely with an oncology Fellow who will assist in the clinical teaching experience. National Cancer Inst.

405 **Introduction to Medical Oncology** (arr.) — Priebat
New patient consultations, ward rounds, and clinic on patients with both hematologic malignancies and solid tumors. Daily discussions on selected topics in medical oncology. Interdisciplinary conference with V.A. Hosp. also included. Wash. Hosp. Center.

412 **Gastroenterology** (arr.) — Danish and Staff
Work in a suburban office devoted to private practice of internal medicine with emphasis on gastroenterology. Office practice, hospital rounds at Holy Cross and Washington Adventist Hospitals, evaluation of problems, discussion with attending physicians and patients in terms of diagnosis and management, observation of and assistance in specialized GI procedures, and practical aspects of office management.

413 **Gastroenterology/Hepatology** (5) — Fromm and Staff
Intensive clinical experience with patients who have disease of the gastrointestinal tract, liver, and pancreas. Patient consultations, teaching rounds, seminars. Joint conferences with surgery, pathology, and radiology emphasize multidisciplinary approach to digestive diseases. Univ. Clinic.

414 **Gastroenterology/Hepatology—Nutrition** (arr.) — Seeff
Students work closely with Fellows in the gastroenterology/hepatology section, seeing patients on consultations and being involved in the initial evaluation, patient investigation, and follow-up. Close supervision is afforded by both the senior Fellows and senior staff. Direct or indirect participation in all specialized procedures involving various biopsy techniques and endoscopies. Teaching rounds, conferences, and seminars. V.A. Hosp.

415 **Gastroenterology** (arr.) — Gold
Course includes direct patient contact on a consultative basis and participation in all section activities, including reviews of gastrointestinal pathology and radiology for individual patients and all procedures, particularly endoscopic. The student will be expected to develop a fundamental core knowledge of basic gastroenterology and to participate in a journal activity and may be called on to participate in a case presentation at monthly joint GI Grand Round sessions. Wash. Hosp. Center.

416 **Gastroenterology—D.C. General Hospital** (arr.) — Rudzki and Staff
Participation in the daily activities: ward rounds with Fellows and attendings, endoscopic procedures (performed twice a week), journal club, GI

medical–surgical conference, teaching conferences, and weekly clinic session. Direct responsibility for a number of consultations under the supervision of the GI Fellows.

417 Gastroenterology (arr.) — Peura and Staff
Participation in daily inpatient and outpatient activities of the service. Walter Reed Hosp.

418 Gastroenterology (arr.) — Cattau and Staff
Participation in daily inpatient and outpatient activities of the service. Bethesda Naval Hosp.

419 Gastroenterology (arr.) — Gibbons
Responsibility for the care of patients admitted with GI problems and consultations on patients on other services. Daily rounds and a weekly teaching conference. Maximal exposure to endoscopic procedures, including esophagogastroduodenoscopy, colonoscopy and polypectomy, laparoscopy, liver biopsies, and esophageal dilatation. Involvement with all patients in the Intensive Care Unit with acute gastroenterology problems. Providence Hosp.

423 Gastroenterology (5) — Trujillo, O'Kieffe
Introduction to clinical problems in diagnosis and treatment of gastroenterology in both office and hospital practice. Peritoneoscopy, endoscopy, and biopsies. 4-week elective periods. Univ. Hosp.

430 Hematology (arr.) — Schechter* and Staff
Participation in the evaluation and treatment of patients with hematological disorders. Ward rounds, morphology review sessions, hematology clinic, and journal club. V.A. Hosp.

431 Hematology and Oncology (arr.) — Lessin and Staff
Immersion in the process of diagnosis and therapy of hematologic and oncologic disorders, including inpatient and outpatient consultations, daily care, and follow-up of clinical hematologic and oncologic problems. Emphasis on blood and marrow morphology, tumor pathobiology, modern hematologic oncologic diagnostic procedures, and treatment of blood diseases and cancer.

434 Hematology/Oncology (arr.) — Yoo
Assignment with senior resident seeing all patients with hematologic and tumor problems for whom consultation is requested. Interpretation of blood smears and blood coagulation studies. Assist in performance and interpretation of bone marrow examinations. Providence Hosp.

436 Hematology Research (arr.) — Schechter* and Staff
Research interests of the staff include lymphocyte tumor biology stem cell culture and platelet production and hemostasis. Facilities available to do *in vitro* culture of human peripheral blood, bone marrow, and tumors; radioisotopic studies; and electron microscopy. V.A. Hosp.

440 Pulmonary Medicine (arr.) — Spagnolo and Staff
Participation in the diagnosis and therapy of patients with pulmonary disease; introduction to the management of patients with acute respiratory failure. Daily ward rounds, chest roentgenology review sessions, participation in journal club and physiology conference. Emphasis on acquainting the student with modern pulmonary diagnostic procedures and current literature. V.A. Hosp.

441 Pulmonary Disease (arr.) — Weiss
Responsibility for the care of patients admitted with pulmonary problems as well as performing consultations on patients on other services. Daily rounds and a weekly teaching conference. Weekly pulmonary physiology conference in which arterial blood gases, pulmonary function testing, and principles of respiratory care are discussed in depth. Consultation services and daily care of a small number of inpatients. Exposure to such procedures as pleural

*Dr. Schechter is Chief of the Hematology Section at the Veterans Administration Hospital.

biopsy, thoracentesis, lung needle biopsies, and arterial puncture. Involvement on a consulting basis with all patients in the Intensive Care Unit with acute respiratory problems. Providence Hosp.

442 **Pulmonary Diseases** (5) Horwitz, Schwab, Friedman
Interpretation of pulmonary function studies; daily teaching rounds and supervised consultation on patients with various pulmonary and infectious diseases. Participation in pulmonary clinic; techniques and principles of respiratory therapy. Principles of and experience with respiratory failure and respiratory intensive care. Wash. Hosp. Center.

447 **Pulmonary Medicine** (5) Spagnolo and Staff
Participation in the diagnosis and therapy of patients with pulmonary disorders. Ward rounds, chest roentgenology sessions, and participation in journal club. Emphasis on acquainting the student with modern diagnostic procedures and current literature related to patients with pulmonary diseases. Univ. Hosp.

451 **Arthritis and Rheumatic Diseases** (5) White
Participation in the evaluation and treatment of patients with rheumatic diseases, including inpatient and outpatient consultations, daily care and follow-up, and clinical conferences. Regular discussions of selected topics in rheumatology, emphasizing differential diagnosis, pathophysiology, and therapeutic modalities.

452 **Rheumatology** (5) Nashel and Staff
Active participation in the work-up and management of inpatients and clinic patients with rheumatic diseases. History, physical examination, differential diagnosis, immunological mechanism, X-ray reading, and use of laboratory tests will be stressed. V.A. Hosp.

453 **Introduction to Arthritis** (arr.) Barth
Work-up, rounds, clinic, and consultations on patients with arthritis and rheumatic diseases. Daily discussions on selected topics in rheumatology, including clinical immunology, major disease categories (SLE, RA, gout, etc.), differential diagnosis, drug therapy, serological reactions, X-ray changes. Wash. Hosp. Center.

454 **Rheumatology and Orthopaedics (Pediatric)** (arr.) White and Staff
Students participate in the evaluation, treatment, and follow-up of children with rheumatic and orthopaedic problems. Responsibilities in outpatient and inpatient services; can elect to participate in operations. Regular discussions of selected topics in rheumatology and orthopaedics; participation in clinical conferences, including physical medicine and radiology.

455 **Physical Medicine and Rehabilitation** (arr.) Chiu
Management of patients on the rehabilitation inpatient service under supervision. Initial medical and neurological work-up, setting of goals, and participation in team conferences. Outpatient work will include the use of electromyography and the neuromuscular examination as diagnostic tools and management of common musculoskeletal conditions. Rounds and teaching activities.

460 **Renal and Electrolyte Disorders** (arr.) Pierce
Participation in consultations, rounds, and outpatient clinic on patients with renal and electrolyte abnormalities; follow-up of patients. Examination of the urinary sediment, peritoneum, and hemodialysis. Conferences, reading assignments, ward rounds, participation in journal club. Wash. Hosp. Center.

461 **Renal Disease** (5) Thompson and Staff
Participation in clinical and laboratory procedures used in the study of renal disease. Ward rounds, consultations, conferences, seminars. Univ. Hosp.

463 Diagnostic Laboratory Immunology (5) Phillips
Introduction to interpretation of the various laboratory assays used in clinical diagnostic immunology. Basic refresher in clinically applied immunology and its relationship to autoimmunity and immunologically mediated pathology. Clinical techniques for altering the course of immunological diseases, such as plasmapheresis, will be demonstrated. Tissue immunology as related to typing transplant patients will be included.

465 Renal Diseases and Fluid and Electrolyte Problems (5) Jacobson
Participation in office and hospital consultations; care of patients with renal diseases and fluid electrolyte problems. Familiarization with a variety of renal problems; work-ups of patients with renal disease; evaluation of renal function studies. Emphasis on critical use of medical literature.

469 Renal Disease (arr.) Shalhoub* and Staff
Broad exposure to and active participation in all clinical activities of the renal section, including consultations, hemodialysis, outpatient clinic, rounds, conferences, and journal club meetings. Time period must first be cleared through instructor's office. V.A. Hosp.

471 Allergy Clinic (arr.) Summers and Staff
Lectures, conferences, and attendance at the allergy clinic, where both adult and child patients are seen. Detailed history taking, physical examination, and skin-testing techniques. Discussion of each case with an allergist to develop a complete management program. Emphasis on clinical aspects of immunology. Walter Reed Hosp.

472 Private Office Practice of Allergy (3) Barr and Staff
Combined elective with allergy clinic at Univ. Hosp. and Children's Hosp.

492 Emergency Medicine (arr.) Hannon and Staff
Assignment as an acting physician (resident) in the emergency room. Emergent and nonemergent ambulatory problems. Provide primary care under the direction of full-time physicians and medical and surgical residents. Patients are seen with medical, surgical, pediatric, psychiatric, trauma, and ob/gyn problems. Emergency therapy will be instituted prior to admission or prior to discharge. Providence Hosp.

494 Clinical Cancer Epidemiology (arr.) Levine
Through the clinical epidemiology branch of NIH, students can choose to participate in research and consultation in the clinical etiology of cancer, seeing patients with peculiarities in the occurrence of cancer that raise the possibility of detecting clues to the etiology of tumors; the application of computer technology to epidemiologic studies; or registry of rare tumors (investigating etiology of rare disorders, e.g., the American Burkitt Lymphoma Registry). Members of this branch participate in the genetics clinic, and opportunities for clinical contact while pursuing a research experience and learning basic epidemiologic approaches are possible. Useful for students considering preventive medicine/epidemiology/public health as a career. N.I.H.

495 Oncology Review (arr.) Hollinshead
Each student is assigned a carefully selected reading list on one form of cancer. Fundamentals, basic research, and latest clinical approaches are discussed in detail. Each student writes and illustrates a review of his or her subject. Interested students are encouraged to undertake a research project the following summer.

499 Clinical Electrocardiography (1) Calatayud
EKG interpretation. EKG diagnosis using the spacial vector approach of Dr R. P. Grant. Diagnosis of arrythmias, cardiac pacing, holter EKG monitor-

*Dr. Shalhoub is Chief of the Renal Section at the Veterans Administration Hospital.

ing, and exercise electrocardiography. All members of the division of cardiology participate in at least one lecture.

501 **Immunopathogenesis of Human Disease** (3) Schulof
Two-week course to review recent advances in immunobiology and correlate this information with clinical manifestations and immunopathogenesis of selected human diseases. Lectures, group discussions based on relevant clinical problems, required reading, and independent library research. Students are required to prepare a paper based on independent study and present the findings at a seminar during the second week of the course. Offered only if a minimum of seven students register.

502 **Issues in Clinical Nutrition** (3) Spiegel, Walker, Fromm
Intensive two-week analysis and evaluation of recent scientific data in the area of human nutrition. Topics include megavitamins, trace elements, food additives, fiber content, lipids, proteins, immunological responses, and nutrition as they influence health and disease. Faculty from the Departments of Biochemistry and Medicine participate in the course. Daily didactic sessions; three seminars per week for discussion and analysis of assigned reading. Each student studies one specific area of interest and presents a written analysis of the scientific data.

503 **Clinical Physiology of Acid–Base and Electrolyte Disorders** (3) Kimmel
In-depth review of renal physiology as it relates to clinical medicine. Emphasis on water and electrolyte regulation as well as acid–base and electrolyte disorders. Daily didactic sessions; three seminars with problem-solving cases per week; homework exercises and assigned reading. Each student prepares an in-depth written report on a clinical entity directly related to a selected fluid and electrolyte disorder, to be presented in the seminar.

Microbiology

Chairman: L.F. Affronti

128 **Microbiology for New Health Practitioners** (2) Staff
(Same as HCS 121)
Lecture course for students in Allied Health programs. Basic concepts of microbiology and principles of microbial defense. Study of microorganisms of medical importance.

129 **Immunology: Introduction to Immunologic Fundamentals** (3) Affronti, Silver
Lecture course for medical technology class; open to others. Fundamental immunologic concepts. Serologic and immunologic procedures as applied to clinical and research situations. Prerequisite: an introductory microbiology course and chemistry (inorganic and organic), or permission of instructor. (Spring)

201 **Medical Microbiology** (8) Staff
Required for medical students; open to qualified graduate students with permission. Bacteria, rickettsiae, viruses, yeasts, molds, protozoa, metazoa, and immunological concepts that relate to the health and disease of humans—cultural studies, methods of diagnosis, theories. Laboratory fee for nonmedical students, $20. (Spring)

211 **Microbiology** (4) Staff
For graduate students. Bacteria, viruses, rickettsiae, fungi, parasites, and immunological concepts. Prerequisite or concurrent registration: Bioc 221–22 or other biochemistry course and permission of instructor. Laboratory fee, $20. (Fall)

212 Pathogenic Bacteriology (3) Hugh
For graduate students. Principles of bacteriology and pathogenic characteristics of bacteria with emphasis on pathogenesis, prevention, and control of bacterial disease of man. Prerequisite: Micr 211 or equivalent. Laboratory fee, $20. (Spring)

214 Tissue Cell Culture (3) Staff
For graduate students. Fundamental aspects of tissue culture with emphasis on mammalian cells. Specialized techniques and applications of cell culture procedures with emphasis on quality control practices. Prerequisite: Micr 211 or equivalent. (Spring)

215 Parasitology (2) Turner
For graduate students; open to medical students. Study of host–parasite relationships. Clinical recognition of important parasites in medicine (Fall)

219 Scientific Writing (1) Wagner
For graduate students. Provides basis for preparing theses, dissertations, and publications. (Fall)

223 Antimicrobial Chemotherapy (1) Reich
For medical students. Lecture course. Selection, clinical applications, and mechanism of action of various drugs and antibiotics used in the treatment of microbial infections. Members of the clinical faculty discuss relevant aspects of clinical chemotherapy. Prerequisite: Micr 201. (Fall)

225 Microbial Physiology I (3) Reich
For graduate students. Microbial structure, nutrition, transport, growth, genetics, metabolism, and regulatory mechanisms. Prerequisite: Bioc 221–22, Micr 211, or equivalent. (Fall)

226 Microbial Physiology II (3) Reich, De Giovanni-Donnelly
For graduate students. Actions of antimicrobial agents and antibiotics on the structure and biochemistry of microorganisms at the cellular and molecular levels. Prerequisite: Micr 225 or permission of instructor. (Spring)

227 Microbial Physiology Laboratory (2) Reich
For graduate students. Application of laboratory techniques and instrumentation to topics covered in Micr 225–26. Prerequisite Micr 226. Laboratory fee, $20. (Fall)

229 Immunology (3) Kind, Affronti
For graduate students. Lecture course. Fundamental immunologic concepts. Lectures cover antigens, antibodies, antigen–antibody reactions *in vitro* and *in vivo*, and the immune response. Prerequisite: Micr 211 or permission of instructor.

230 Immunology Laboratory (2) Kind, Affronti
Methods in serology, immunochemistry, and cellular immunology that are used in research laboratories are emphasized. Prerequisite or concurrent registration: Micr 229 or permission of instructor. Limited to students enrolled in a degree program. Laboratory fee, $20. (Fall, odd years)

231 Immunobiology (1) Affronti, Kind
Lecture course. Study of immunological functions of reticuloendothelial tissues, theories of autoimmunity, graft rejection, tumor immunity, and delayed hypersensitivities. For medical students; open to graduate students with permission of instructor. (Fall)

233 Virology (3) Stokes
For graduate students. Biochemical, genetic, and pathogenic characterization of viruses. Prerequisite: Micr 211 or equivalent. (Fall)

234 Virology—Laboratory (2) Stokes
For graduate students. Laboratory complement to Micr 233. Prerequisite or concurrent registration: Micr 233. Laboratory fee, $20. (Fall)

235 **Systematic Bacteriology** (2) Hugh
For graduate students. History of bacterial classification, international rules of nomenclature as applied to bacteria, development of bacterial classification based on relationships, and survey of characteristics of bacterial groups. Prerequisite: Micr 201 or 212 or equivalent. (Fall, odd years)

250 **Pathogenesis of Microbial Infections** (1) Hugh
Physiological, anatomical, pathological, genetic, and biochemical bases for the pathogenesis of selected bacterial, mycotic, viral, and parasitic infections in humans. Host and agent factors that specifically influence resistance to infection.

251 **Clinical Laboratory Bacteriology** (3) Hugh
For graduate students; open to medical students. Detection and identification of bacterial agents that cause diseases in humans. Comparative isolation and identification methods; emphasis on interpretation and significance of laboratory observations. Prerequisite: Micr 201 or equivalent. (Fall, even years)

252 **Medical Parasitology** (1) Turner
For medical students; open to graduate students. Lecture and laboratory course. Life cycles, epidemiology, manifestations, pathology, diagnosis, treatment, and prevention of medically important protozoan and helminthic infections are presented. In the laboratory, the recognition and identification of the etiologic agents causing disease through the study of living and preserved specimens are emphasized. (Fall)

255 **Clinical Virology** (1) Grossman, Stokes
Primarily elective course for medical students; open to graduate students. General principles of virology and infectious diseases; emphasis on clinical situations. Prerequisite: Micr 201 or equivalent. (Fall)

257 **Experimental Immunochemistry** (3) Affronti
For graduate students. Biochemical and physiochemical characterization of antigens and antibodies. Prerequisite: Bioc 221–22 or equivalent, Micr 229. Laboratory fee for nonmedical students, $20. Limited enrollment. (Spring, even years)

258 **Microbial Genetics** (2) De Giovanni-Donnelly
For graduate students. Survey of microbial systems that depict basic concepts of genetic principles. Prerequisite: Micr 211 or equivalent. (Spring)

260 **Cellular Immunology** (1) Kind
For graduate students. Advanced seminars in cellular aspects of the immune response. Content differs each time course is offered. May be repeated for credit. Prerequisite: Micr 229. (Spring)

277–78 **Seminar: Microbiology** (1–1) Staff
Required of graduate students. (Academic year)

281 **Biological Basis of Infections** (arr.) Affronti, Wagner
Selected problems, library assignments, laboratory studies, term paper.

282 **Immunology** (arr.) Affronti, Kind
Selected problems, library assignments, laboratory studies, term paper.

290–91 **Extramural Microbiology Elective** (arr.)
The department may arrange for medical students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

293 **Special Topics in Microbiology** (arr.) Staff
Selected topics in microbiology. May be repeated for credit. (Fall and spring)

295 **Research in Microbiology** (arr.) Staff
By special arrangement with individual staff members, a limited number of students with previous background in research may register for 2 to 4

semester hours of credit. Four clock hours will be spent in laboratory work for each semester hour of credit. Research report required. Content differs each time course is given. May be repeated for credit. (Fall and spring) Staff

299–300 **Thesis Research** (3–3)
(Fall and spring) Staff

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring) Staff

399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring) Staff

800 **Summer Remedial: Microbiology** (8) Affronti

Neurological Surgery

Chairman: H.V. Rizzoli

302 **Clinical Clerkship in Neurosurgery** (3) Rizzoli
Introduction to neurosurgery, emphasizing the neurological examination, diagnosis, and rudiments of treatment. It will fulfill the neuroscience course requirements. Univ. Hosp.

380 **Neurosurgery** (5) Rizzoli
Clinical clerkship in neurosurgical service. Emphasis on neurologic examination; indications for special neurologic and operative procedures. Med. Fac. Assoc.

382 **Neurosurgery** (5) Harris, Pulliam
Participation in all departmental activities: ward rounds, daily conferences, radiographic and pathologic studies, operating room procedures. Nat'l. Naval Med. Center.

383 **Pediatric Neurosurgery** (arr.) McCullough and Staff
Participation in all departmental activities: ward rounds, daily conferences, radiographic studies, and operating room procedures. Children's Hosp.

387 **Neurosurgery** (arr.) Cooney
Participation in all departmental activities: ward rounds, daily conferences, radiographic studies, and operating room procedures. Wash. Hosp. Center.

390–92 **Extramural Neurosurgery Elective** (arr.)
The department may arrange for students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

Neurology

Chairman: G.F. Molinari

380 **Neurology** (arr.) Molinari and Staff
Expertise in performing the neurological examination taught through work-up of new hospital and clinical patients. Emphasis on the anatomical localization of neurological symptomatology. Introduction to differential diagnosis. Familiarization with indications for neurological procedures (Ct scanning, arteriography, myleography, evoked potentials, and EEG). Lecture series reviews the basic categories of neurological diseases.

383 **Neurology** (5) — Gunderson
Development of proficiency in assessing common neurologic problems through mastery of the routine neurologic history and physical examination, use of laboratory aids, and application of neuroanatomy to clinical problem solving. Treatment of common neurology problems. Walter Reed Hosp.

384 **Neurology** (arr.) — Laureno
Clerkship in neurology. Participation in neurology consultation service, clinic, and seminars. In-depth research for formal seminar presentation. Wash. Hosp. Center.

390–94 **Extramural Neurology Elective** (arr.)
Students electing clerkships at the University Hospital can spend another elective period in another institution. They should arrange the elective with the other institution and bring a letter of acceptance to the chairman of the department of neurology for approval.

395 **Neurology Research** (arr.) — Laureno
Participation in ongoing research in nutritional deficiency, toxins, and fluid electrolyte derangements and their effects on brain and muscle. Interested students should contact Dr. Laureno before registering for this elective. Wash. Hosp. Center.

Obstetrics and Gynecology

Chairman: A.B. Weingold

303 **Clinical Obstetrics and Gynecology** (10) — Davis
Required for medical students. Participation in all obstetrical and gynecological clinics, daily departmental conferences and ward rounds at University, Fairfax, and Holy Cross Hospitals. Mannequin demonstrations of mechanism of labor and various types of operative delivery. (8-week periods throughout academic year)

376 **Gynecologic Oncology** (5) — McGowan
Participation in clinical inpatient and office diagnosis and treatment of women with gynecologic cancer. Med. Fac. Assoc.

377 **Cytogenetics and Prenatal Diagnosis of Birth Defects** (arr.) — Larsen
Study of cytogenetics and participation in genetic counseling, amniocentesis, and laboratory evaluation of amniotic fluid. Interpretation and preparation of chromosome karyotype.

378 **Reproductive Endocrinology and Infertility** (arr.) — Stillman, Littman
Participation in patient management of gynecologic endocrine and infertility problems. Encompasses infertility work-up and operative diagnostic and therapeutic procedures, including in vitro fertilization/embryo transfer.

380 **Clinical Obstetrics and Gynecology** (arr.) — Gahres, Radice
Participation in patient care, clinics, surgery, and delivery. Alexandria Hosp.

381 **Perinatal Medicine** (arr.) — Weingold and Staff
Participation in high-risk obstetrics clinics and antepartum and intrapartum management of high-risk and normal obstetrical patients. Participation with the Fellow in maternal–fetal medicine at the University Hospital and outlying hospitals.

382 In-Vitro Fertilization (arr.) — Naz, Stillman
Clinical and laboratory work with the GWU in-vitro fertilization team. Laboratory-based research in embryology and developmental genetics. IVF team conferences, patient-care activities, readings on technical, ethical, legal, and social aspects of IVF and IVF techniques.

383 Clinical Gynecology (arr.) — Footer
Participation in office practice of gynecology.

390–95 Extramural Obstetrics and Gynecology Elective (arr.)
The department arranges for students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

501 Didactic Reproductive Biology (3) — Isada
An intensive interdisciplinary course. Lectures, labs, reading, and seminars reviewing basic anatomy, histology, embryology, and pathology of the female reproductive tract in the context of clinical obstetrics and gynecology.

Ophthalmology

Chairman: M.F. Armaly

381 Clinical Ophthalmology (arr.) — Armaly and Staff
Observation and participation in examination, diagnosis, and management of wide variety of ocular conditions in ambulatory patients. Emphasis on conducting a general ophthalmic examination, recognition of abnormal findings, and management of common ocular diseases. Lectures, rounds, and seminars. Med. Fac. Assoc.

382 Clinical Ophthalmology (arr.) — Sawyer and Staff
Observation and participation in examination, diagnosis, and management of wide variety of ocular conditions. Emphasis on conducting a general ophthalmic examination, recognition of abnormal findings, and management of common ocular diseases. Lectures, rounds, and seminars. Nat'l. Naval Med. Center.

383 Clinical Ophthalmology (3) — Ibrahim and Staff
Examination techniques, management decisions, follow-up, and outcome of clinical entities. Observation, demonstration, and discussion with the clinical faculty. G.H.A.

390–92 Extramural Ophthalmology Elective (arr.)
Special elective program arranged for selected students at other institutions. Interested students should contact the chairman of the department.

Orthopaedic Surgery

Chairman: J.P. Adams

302 Clerkship in Orthopaedic Surgery (3) — Labropoulos and Staff
Basic clinical rotation. Didactic sessions on physical diagnosis, X-ray inter-

pretation, arthritis, trauma, and reconstructive surgery. Remaining time is spent with the orthopaedic residents, on ward rounds, in the Emergency Room or Operating Room, or attending conferences. Night call is generally a requirement.

380 **Orthopaedic Surgery** (5) Wiesel
Students participate in care of orthopaedic inpatients and outpatients, daily rounds, and conferences under the direction of a faculty member at the University Hospital or one of the affiliated hospitals. Prerequisite: Orth 302.

383 **Sports Medicine** (5) Haas and Staff
Introduction to athletic injuries, including prevention and management. Prerequisite: Orth 302.

390–93 **Extramural Orthopaedic Surgery** (arr.)
The department arranges for students to spend elective periods in other institutions. Prerequisite: Orth 302. Interested students should contact the chairman of the department.

Pathology

Chairman: H. Sidransky
Directors of Divisions: S.G. Silverberg *(Anatomical Pathology)*, D.S. Wilkinson *(Clinical Pathology)*

Courses numbered 13–20 are limited to military personnel in the Medical Laboratory Technique Program.

13 **Hematology** (6) Staff
Basic hematologic procedures, diagnosis of abnormalities of cellular elements of blood and bone marrow, studies in blood coagulation, quality control in clinical hematology.

14 **Blood Banking** (6) Staff
Principles of immunohematology, blood donor center techniques, blood processing techniques, quality control in blood banking.

15 **Clinical Laboratory Rotation** (14) Staff
Instructions in laboratory technique, stressing the application of theories and principles of clinical chemistry, clinical microbiology, hematology, and blood banking in the day-to-day operations of the modern clinical laboratory.

16 **Clinical Chemistry** (5) Staff
Principles and techniques of blood chemistry analyses, including toxicological analyses for drugs of abuse and environmental poisons.

17 **Urinalysis** (2) Staff
Principles and techniques of urine chemistry and microscopic analysis.

18 **Bacteriology** (6) Staff
Identification of pathogenic microorganisms by morphologic and cultural techniques.

19 **Parasitology** (4) Staff
Identification of human parasites and their life cycles; concentration methods, staining techniques, and media for culture.

20 Serology (2) Staff
Principles and techniques of antigen–antibody reaction and immunological responses.

Courses numbered 121–128 and 130–133 are open only to students enrolled in the Bachelor of Science degree program with a major in medical technology.

121 Introduction to Medical Technology (4) Silver, Smith
Orientation to laboratory medicine. Lecture and laboratory series in clinical chemistry, hematology, microbiology, and immunohematology. Path 121 is a prerequisite to all other courses in the clinical year program in medical technology. (Fall)

122 Clinical Chemistry (3) Staff
Lecture series covering the principles and procedures involved in chemistry analysis of human blood and body fluids. Clinical correlations and pathological aspects of human disease. Prerequisite: Path 121.

123 Clinical Microbiology (2) Silver
Lecture series in clinical microbiology, with emphasis on pathogenic characteristics, isolation, and identification of organisms related to human disease. Prerequisite: Path 121.

124 Immunohematology (1) Marsh and Staff
Lecture series on immunological aspects of transfusion of human blood. Emphasis on preparation and administration of blood components. Prerequisite: Path 121.

125 Clinical Hematology and Coagulation (2) Smith
Lecture series on the laboratory detection, clinical correlation, and pathophysiology of human blood cell diseases and coagulation disorders. Prerequisite: Path 121.

126 Special Topics in Laboratory Medicine (2) Staff
Principles of clinical parasitology, mycology, serology, laboratory management, and education techniques. Prerequisite: Path 121.

127–28 Pathology for New Health Practitioners I and II (2–2) Staff
Lecture course with optional laboratory. Basic pathologic concepts and infectious diseases; language of pathology; fundamental disease processes. Emphasis on pathogenesis and dynamics of disease. Causation, evolution, and morphology of pathologic changes in the principal diseases of each organ system, presented in coordination with clinical lectures in Idis 301. (Academic year)

130 Clinical Chemistry Practicum (4) Silver
Rotation through the University Hospital clinical chemistry laboratory. Prerequisite: Path 121.

131 Clinical Microbiology Practicum (4) Silver
Rotation through the University Hospital clinical microbiology, mycology, and parasitology laboratories. Prerequisite: Path 121.

132 Hematology/Coagulation Practicum (4) Silver
Rotation through the University Hospital clinical hematology and coagulation laboratories. Prerequisite: Path 121.

133 Blood Bank/Serology/Urinalysis Practicum (4) Silver
Rotation through the University Hospital blood bank, serology, and urinalysis laboratories. Prerequisite: Path 121.

140 Independent Study in Medical Technology (arr.) Staff
Intensive review of medical technology with assigned readings and participation in selected courses in the medical technology program. Students may register by petition only.

152 **Introduction to Basic Laboratory Medicine** (2) Smith
Theory, performance, and interpretation of some important routine clinical laboratory tests performed in a physician's office, such as complete blood counts with differentials, staining and reading smears, urinalysis and microbiological culture and staining techniques, and organism identification. Lectures, demonstrations, audiovisuals, and laboratory. Prerequisite: Path 127–28. (Summer)

201 **Pathology** (8) Kent
A year course; required for second-year medical students. General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies.

203–4 **Pathology** (4–4) Staff
For graduate students. General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies. Limited enrollment. Prerequisite to Path 204: Path 203. (Academic year)

217 **Gross Autopsy Pathology** (1) Orenstein and Staff
Review of current necropsy cases with emphasis on the correlation of gross changes in the organs and the clinical history. Limited to second-year students. Univ. Hosp. (Spring)

220 **Medical Mycology** (2–4) Al-Doory
Lectures and laboratory to cover pathogenic fungi, mycotic diseases, and their clinical aspects. Laboratory fee, $20. (Fall)

222 **Opportunistic Mycoses** (2) Al-Doory
Study of the opportunistic fungal infections and their serological, clinical, and therapeutic aspects. Emphasis on identification of fungi and evaluation of laboratory findings. Limited to second-year medical students. (Spring)

256 **Pathology of Infectious Diseases** (3) Abraham
For graduate students. Correlation of clinical, physiologic, immunologic, and pathologic mechanisms determining the course and morphological changes occurring in infections. Analysis of human case material and review of assigned selected readings. Prerequisite: Micr 211 and Path 203.

257 **Transmission Electron Microscopy in Pathologic Diagnosis** (3) Orenstein, Abraham
For graduate students. Techniques for the examination and interpretation of ultrastructural changes associated with human disease states. Emphasis on transmission electron microscopy as a diagnostic tool. Prerequisite: Path 203–4, Anat 260 and 261.

258 **Organ System Pathology** (5) Bloom
For graduate students. Gross and microscopic study of human pathologic material reflecting major diseases of specific organ systems. The organ systems studied will be rotated annually, depending on demand. Organ systems to be covered include cardiovascular, digestive, nervous, renal, reproductive, and respiratory. Prerequisite: Path 203–4. Permission of instructor required. (Fall and spring)

261 **Seminar in Experimental Pathology** (1) Sidransky
Current topics in research in experimental pathology. Limited to second-year medical students. (Spring)

266 **Comparative Pathology I** (1) Zook
Participation in an autopsy service involving captive wild animals. Comparison of diseases in various animal species with those in humans. Limited to second-year medical students. Path. Lab., Nat'l. Zoological Park. (Spring)

270 **Medical Mycology** (1) Al-Doory
Review of major mycotic diseases with emphasis on opportunistic mycoses. Second-year students only.

284 **Ophthalmic Pathology** (arr.) McLean and Staff
Daily participation in an active service limited to pathology of the eye and its adnexa. Inflammatory, degenerative, and neoplastic diseases comprise the major categories. Armed Forces Inst. of Path.

286 **Perinatal Pathology** (arr.) Kent
Focuses on important disorders that may beset the human fetus during the intrauterine period of gestation and the newborn infant during the early neonatal period. Emphasis on the role of placental abnormalities. Prerequisite: Path 203 or equivalent. (Spring)

289 **Clinical and Anatomical Pathology** (arr.) Cook and Staff
Designed to familiarize the student with the operation of a community hospital Department of Pathology. Student may elect to spend essentially all of the time in some specialized area or may choose to study only anatomic pathology. If desired, a nuclear medicine elective can also be considered during this period. Fairfax Hosp.

290–92 **Extramural Pathology Elective** (arr.)
The department arranges for medical students to spend elective periods at other institutions. Interested students should contact the chairman of the department.

296 **Surgical Pathology** (arr.) Silverberg and Staff
Evaluation of surgical specimens and correlation with clinical status of patient; description of gross and microscopic findings on assigned cases. Univ. Hosp.

298 **Necropsy Pathology** (arr.) Orenstein, Kent
Organ changes in disease, gross and microscopic correlation, preparation of protocols. Participation in autopsy pathology service. Univ. Hosp.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

301 **Clinical and Anatomical Pathology** (arr.) B. Smith and Staff
Opportunity to explore in depth a topic selected from the field of pathology; library study. V.A. Hosp.

302 **Forensic Pathology** (arr.) Dibdin and Staff
Participation in the activities of the office of the Chief Medical Examiner of the District of Columbia. Observation of death scene investigation techniques, medical–legal autopsies, and related toxicological laboratory analyses; attendance at court trials; and participation in the various conference activities of the agency.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

501 **Selected Topics in Pathology** (3) Kent
Guided in-depth readings and study and/or laboratory experience in an aspect of pathology of particular interest to students. A section for study may be selected from a substantial list available in the Department of Pathology. Students will present a report on the specific topic.

800 **Summer Remedial: Pathology** (8)

Pharmacology

Chairman: H.G. Mandel

110–11 **Pharmacological Basis of Anesthesia** (4–4) Mazel and Staff
For students in nursing anesthesia. Fundamental principles of pharmacology; drugs affecting the autonomic nervous system, central nervous system, and cardiovascular system; fundamentals of inhalation anesthesia; auxiliary drugs used in anesthesiology; endocrines, cancer chemotherapy; other topics. (Academic year)

114 **Drugs and the Consumer** (3) Cohn and Staff
General concepts concerning drug action in the body. Mechanism of action of some specific prescription and nonprescription drugs, including contraceptives; tranquilizers and sleep-inducing drugs; hay fever, headache, and cold remedies; analgesics; antibiotics; vitamins. Issues related to development and marketing of drugs, drug safety, drug advertising, generic versus trade-name drugs, drug use in sports, drug use during pregnancy, smoking and health. No science prerequisite required. Limited enrollment. (Fall)

115 **Nonmedical Use of Licit and Illicit Drugs** (3) Cohn and Staff
Psychological and sociological bases of recreational and other nonmedical use of drugs, pharmacological and toxicological aspects of drug action on both the brain and peripheral organ systems, legal and societal implications of and reactions to the nonmedical use of drugs, and prevention and treatment of drug dependence. Lectures and discussions on alcohol, narcotics, central nervous system stimulants and depressants, marijuana, and hallucinogenic and psychedelic drugs. (Spring)

120 **Readings in Pharmacology for Anesthesia** (arr.) Mazel and Staff
For students in nursing anesthesia. Assigned readings in anesthesia and related areas; preparation of reports. Students may register by petition only.

124–25 **Chemistry and Physics of Anesthesia** (3–3) Mazel and Staff
(Formerly Phar 121–22)
For students in nursing anesthesia. Fundamental concepts of physics, general chemistry, organic chemistry, biochemistry, and their application to medicine and anesthesiology, including chemistry of respiration, acid–base balance, clinical biochemistry and enzymology, hormones, radioisotopes, electronics, physiochemical properties of anesthetic agents, and other related topics. (Academic year)

130 **Seminar: Accessory Drugs in Anesthesia** (2) Mazel and Staff
For students in nursing anesthesia. Presentation of the pharmacology and pharmacodynamics of accessory anesthetic drugs; emphasis on those areas not covered in Phar 110–11.

158 **Pharmacology for New Health Practitioners** (2) Klubes and Staff
For students in allied health programs. Basic pharmacology course. Drug preparations, the basis of their therapeutic and toxic actions, and their fate in the body. Prerequisite: Anat 115, Phyl 111.

191 **Respiratory Care** (3) Mazel and Staff
For students in nursing anesthesia. Advanced techniques for care of patients requiring total respiratory support. Same as Anes 191.

195 **Electronics for Medical Personnel** (2) Mazel and Staff
For students in nursing anesthesia. Introduction to fundamental principles used in electronic instrumentation for monitoring patient status in operating room and intensive care unit. Signal conditioning, processing and display techniques, special purpose instruments, safety hazards. Same as Anes 197.

201–2 Pharmacology (6–2) Mandel and Staff
Required for second-year medical students. Lectures, laboratory, and conferences on interaction of drugs and biological systems as a basis for rational therapy of disease. Prerequisite: Bioc 201, Phyl 201, 212.

203 Fundamental Principles of Pharmacology and Toxicology (3) Cohn and Staff
For graduate students. Basic principles of pharmacology, including drug-receptor interactions, structure activity relationships, pharmacokinetics, membrane phenomena, cellular control mechanisms; mechanisms of mutagenesis, carcinogenesis, teratogenesis, and specific organ toxicity; risk assessment and extrapolation. Admission by permission of instructor. (Fall)

205 Pharmacology (8) Cohn and Staff
For graduate students. Lectures, laboratory, conferences on interaction of drugs and biological systems as a basis for rational disease therapy. Prerequisite: Phar 203, courses in biochemistry and physiology, or approval of department. (Fall)

207 Cardiovascular Pharmacology (2) Staff
For graduate students. Physiology and pharmacology of cardiovascular diseases, hypertension, heart failure, coronary artery disease, and arrhythmia. Mechanism of action of drugs used in the treatment of cardiovascular diseases. Prerequisite: Phys 201 and Phar 201, 203, or 205. (Spring)

220 Molecular Events in Toxic Actions (2) Staff
For graduate students. Metabolism of xenobiotics to cytotoxic products. Environmental and genetic factors influencing toxic actions. Molecular mechanisms of toxicity. Prerequisite: Phar 203. (Spring)

222 Genetic Toxicology (2) Barrows
For graduate students. Action of chemicals and radiations in the induction of DNA damage and repair *in vitro* and *in vivo* and the sequelae of these processes in cells and mammals. DNA repair mechanisms, mammalian cell toxicity, mutagenesis, and carcinogenesis. Prerequisite: Bioc 221–22. (Fall)

224 Developmental Toxicology (2) Staff
For graduate students. Effects of exogenous agents on the processes of reproduction and development and their mechanisms of action. Toxic effects on the gametes, embryo, fetus, and neonate. Prerequisite or concurrent registration: Phar 203, 205. (Fall)

226 Neurotoxicology (2) Staff
For graduate students. Mechanisms by which chemicals produce toxic effects on nervous tissue at subcellular, systemic, and behavioral levels. Effects of chronic and acute exposure. Prerequisites or concurrent registration: Phar 203, 205. (Spring)

230 Special Topics in Toxicology (arr.) Staff
For graduate students. Selected aspects of toxicology. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

254 Frontiers in Pharmacology (1) Abramson and Staff
For medical and graduate students. Recent advances and fields of research in pharmacology. Presentations by laboratory scientists from neighboring institutions. (Spring)

258 Cancer Chemotherapy (1) Mandel and Staff
For medical and graduate students. Seminars by visiting scientists on mechanisms of cancer causation and treatment. (Spring, even years)

259 Readings: Cancer Chemotherapy (2) Barrows and Staff
For medical and graduate students. Selected readings and discussions of

recent advances in cancer chemotherapy research. Prerequisite: Phar 201 or 205. (Spring, odd years)

260 **Endocrine Pharmacology** (1) — Staff
For medical and graduate students. Lectures and seminars on recent advances in the pharmacology and mechanism of action of various hormones. (Spring, odd years)

269 **Pharmacology Seminar** (1) — Mandel and Staff
For graduate students. Recent advances in pharmacology. Content differs each time the course is offered; may be repeated once for credit. (Fall)

272 **Physiological Disposition of Drugs** (3) — Cohn
Mechanisms for the absorption, distribution, metabolism, and excretion of drugs and the physical, chemical, and biological factors affecting these processes. Extensive reading of classical and current original literature. Prerequisite: Bioc 221–22, Phar 203, or permission of the instructor. (Spring)

273 **Pharmacokinetics: Principles and Applications** (2) — Abramson and Staff
For graduate students. Description of compartmental and physiological models of drug disposition. Problem solving to obtain rate constants, organ clearances, etc., from experimental data. Examples of drug disposition exemplifying various pharmacokinetic approaches. (Spring)

275–76 **Advanced Topics in Pharmacology and Toxicology I–II** (1–1) — Kennedy and Staff
For graduate students. Lectures and seminars on advances in mechanisms of drug action, pharmacology of new drugs, theoretical aspects of pharmacology, and laboratory techniques. (Alternate academic years)

277–78 **Advanced Topics in Pharmacology and Toxicology III-IV** (1–1) — Kennedy and Staff
For graduate students. Continuation of Phar 275–76. (Alternate academic years)

279 **Special Topics in Pharmacology** (arr.) — Staff
For graduate students. Selected aspects of drug action. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

280 **Neuropharmacology** (2) — Staff
For graduate students. Fundamental principles. Electrophysiological and biochemical techniques. Neurotransmitters and their pathways in central nervous system. Drug effects on neurotransmitter pathways. Biochemical basis of mental disease. Prerequisite: Phar 205 or equivalent. (Spring)

285 **Readings in Pharmacology** (arr.) — Mandel
Assigned reading and preparation of reports.

286 **Research in Pharmacology** (arr.) — Mazel
For medical students. Participation in experimental studies in pharmacology, particularly neuropharmacology, cancer chemotherapy, or drug metabolism. (Fall and spring)

287 **Readings in Drug Abuse Literature** (arr.) — Cohn
Both professional and nonprofessional literature in the general area of drug dependence. Informal monthly luncheon discussions or assigned reading and preparation of a report. (Spring)

290–91 **Extramural Pharmacology Elective** (arr.)
The department arranges for students to spend elective periods in other institutions. Interested students should contact the chairman of the department. (Academic year)

295 **Reading and Research** (arr.) Staff
Independent study for students preparing for the Master of Science degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

501 **Readings in Pharmacology** (arr.) Mazel
Readings, discussions, and/or preparation of report. Student can choose to work with one or more Department of Pharmacology faculty members on a topic of mutual interest. (Fall and spring)

502 **Clinical Use of Drugs** (3) Mandel, Klubes
Approximately 10 morning discussions with a member of the Pharmacology Department and appropriate clinical faculty, dealing with the rational use of drugs in the treatment of disease. Afternoons devoted to independent reading and study. Course will be given only if there are seven participants. (Spring)

503 **Drug Dependence: Basic and Clinical Aspects** (3) Cohn and Staff
Seminars and discussions on various aspects of drug and chemical dependencies, such as recognition and diagnosis of dependence; role of drugs in treating dependence; fetal alcohol syndrome and the addicted neonate; recent research advances in marijuana, cocaine, PCP, and other drugs; treatment of the drug overdose emergency. Independent reading and study.

800 **Summer Remedial: Pharmacology I** (6) Mandel

801 **Summer Remedial: Pharmacology II** (2) Mandel

Physiology

Chairman: R.A. Kenney

Departmental Prerequisite: Phyl 201 or equivalent for all courses numbered above 201.

111 **Physiology for New Health Practitioners** (4) M.E. Tidball
For students in physician assistant, nurse practitioner, and nursing anesthesia programs. Lecture, film, and demonstration. Function and process of the human body, covering the major organ systems.

191 **Selected Topics in Human Structure and Function** (3) Kenney
Lecture (2 hours), laboratory (1 hour). Structural and functional basis of physiology. Undergraduate course, required for graduate students who have not had Anat 201 or equivalent; students may receive graduate credit on completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11–12 or equivalent and consent of instructor. Open to Columbian College students with approval of advisor. (Fall)

201 **Physiology** (8) Staff
Required for medical students, open to graduate students. Lecture (6 hours), laboratory (2 hours), conference (1 hour). Cellular, organ system, and applied

human physiology. Prerequisite for graduate students: Anat 201 or Phyl 191 or equivalent; Bioc 201 or 221–22 (Bioc 222 may be taken concurrently); or consent of chairman of department. Open to consortium students only with permission of department chairman. (Spring)

205 **Cell Biophysics** (2) — Jackson, Kelleher
For graduate students. Lecture (2 hours). Introductory survey of the mechanisms for interconversion and utilization of energy in animal cells. Required for graduate students intending to take Phyl 201. Prerequisite: BiSc 11–12 or equivalent and consent of instructor. (Fall)

212 **Neurobiology** (3) — Staff
For graduate students. Same as Anat 212 and Idis 212. Integrated survey of the structure and function of the human nervous system; lecture, clinical demonstration, and laboratory. Laboratory fee, $25.

221 **Seminar** (1) — Cassidy
For graduate students. Staff and student presentations from literature. Present work discussed; experimental design and scientific deduction evaluated. Topics to be announced. Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

253 **Physiology of Fluid Balance and Hydrogen Ion Regulation** (2) — Cassidy
Discussion of principles of fluid and acid–base balance and the application of these principles to specific situations. (Fall)

261 **Gastrointestinal Physiology** (arr.) — Jackson
For graduate students. Weekly seminar; role of basic sciences in gastroenterology; intra- and extramural speakers. An approved paper required for two semester hours of credit. May be repeated for credit. (Fall and spring)

262 **Topics in Cardiovascular Physiology** (2) — Kenney
Survey, at an advanced level, of aspects of cardiovascular physiology, especially as interrelated with the respiratory and renal systems. (Fall)

268 **Muscle Contraction: Physiological and Biochemical Aspects** (1) — Frank
Anatomical, biochemical, pharmacological, and physiological aspects of muscle contraction.

269 **Topics in Neurophysiology and Psychophysiology** (2) — Lavine
Selected topics in contemporary neurophysiology, including methods of data collection and analysis, control mechanisms involved in movement and behavior, and sensory processing. Admission by permission of instructor. (Fall)

272 **Reading and Research in Simulation of Physiological Processes** (3) — C. Tidball
Readings in physiological simulations and their evaluation. Prerequisite: Permission of instructor. May be repeated once for credit.

282 **Experimental Physiology** (arr.) — Jackson
Participation in an ongoing research program in the department. Programs are currently available in the areas of membrane physiology, intestinal transport, neurophysiology, and cardiovascular physiology.

290–91 **Extramural Physiology Elective** (arr.)
The department arranges for medical students to spend elective periods at other institutions. Interested students should contact the chairman of the department.

295 **Research** (arr.) — Staff
By special arrangement with individual staff members. Approximately four hours in the laboratory for each semester hour of credit. (Fall and spring)

298 Comprehensive Physiology (arr.) Staff
Guided review of selected areas of physiology appropriate to the student's graduate program. Prerequisite or concurrent registration: Phyl 221. (Fall)

299–300 Thesis Research (3–3) Staff
(Fall and spring)

396 Advanced Reading and Research (2) Staff
Limited to students preparing for the Doctor of Philosophy general examination. Tutorial literature survey of a subfield of physiology and of pertinent areas of the candidate's minor field. This course satisfies the requirement for Part II of the Cumulative General Examination in physiology. (Fall and spring)

397 Development of Dissertation Problem (2) Staff
Limited to students preparing for the Doctor of Philosophy general examination. Preparation for written and oral presentation of dissertation problem. This course satisfies the requirement for Part III of the Cumulative General Examination in physiology. (Fall and spring)

399 Dissertation Research (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

501 Physiology of Aging (3) Kenney
Guided reading and discussion on the normal process of aging.

502 Structural-Functional Correlations in GI Disease (arr.) Cassidy
Morphological methodology is a growing technique in the diagnosis and prognostic evaluation of gastrointestinal disease states such as ulceration, colitis, Hirschprungs disease, colorectal carcinoma, and pancreatic malfunction. Techniques considered include traditional light microscopy, scanning and transmission electron microscopy, and immunocytochemistry. Selected readings and discussion.

503 Advanced Physiology Kenney
Guided readings and study and/or laboratory experience at an advanced level in a subfield of physiology.

800 Summer Remedial: Physiology (8) Kenney

Psychiatry and Behavioral Sciences

Chairman: J.M. Wiener

All clinical courses are five semester hours per four-week period.

252 Psychological and Social Factors of Medical Practice (2) Wiener and Staff
Required for medical students. Basic principles of the doctor–patient relationship. Analysis of psychological growth and development, family process, and the personality of the physician as they influence everyday medical practice.

301 Psychopathology and Conceptual Models (2) Hendren and Staff
Required for second-year medical students. Mental mechanisms, psychopathology, introduction to psychiatric syndromes, clinical interviewing, and behavioral sciences in clinical medicine. (Fall)

302 Clinical Clerkship (10) Webster and Staff
Required for medical students. Supervised examination, diagnosis, and outpatient and inpatient treatment at University, St. Elizabeths, Children's,

and Washington V.A. Hospitals and Psychiatric Institute. Case conferences, seminars on psychiatric referral, "psychiatric" drugs, and community resources. Psychiatry in general practice stressed. (Fall and spring)

381 **Clinical Psychiatry** (arr.) **Hendren and Staff**
Participation as acting intern in one or more of the psychiatry services of GWU Medical Center: inpatient and emergency, outpatient, and consultation–liaison and oncology liaison. Assignments are based on student preference within limits of feasibility for the elective period involved. At least eight weeks preferable for supervised psychotherapy experience. Four-week elective emphasizes diagnostic assessment and briefer treatment modalities.

386 **Research and Clinical Approaches to Families of Medical Patients** (5) **Steinglass and Staff**
Introduction to theory, method, and techniques of clinical and research evaluation of families of medical patients; focus on family factors that favor or retard the patient's recovery from serious medical illness. Completion, under supervision, of a small independent project on a topic of student's choice.

388 **Child and Adolescent Psychiatry** (arr.) **Egan and Child Psychiatry Faculty**
Participation as an acting intern in child psychiatry. Consultation to pediatric wards, outpatient evaluation and treatment of selected child patients and their families, and/or inpatient child and adolescent services; eight weeks required for specialized experience in all three areas. Individualized program by arrangement. Assignments based on student's preference and prior experience, within limits of feasibility. Children's Hosp.

390–93 **Extramural Psychiatry Elective** (arr.)
The department may arrange for students to spend elective periods at other institutions. Information on electives at other medical schools available

397 **Schizophrenic and Borderline Conditions** (5) **Fenton, Williams**
Participation in and observation and study of treatment and administrative management of patients. Participation in staff meetings. Individual supervision and selected readings. Chestnut Lodge, Rockville, Md.

406 **Psychiatric Education, Research, and Administration** (arr.) **Robinowitz and Staff**
Student preceptorship: practicum experience, theoretical instruction, participation in research, and individual project. Direct supervision by and close working contact with director and staff of office of education of national specialty society. Opportunity to observe operations and for contacts with leaders in field. Student gains knowledge of research and administration pertaining to women in medicine, psychiatric education, manpower development relevant to health care delivery, continuing education, federal and legislative affairs, health planning, and relation of medical education to practice. Personal interview required to plan individualized program.

409 **Independent Studies** (arr.) **Hendren**
Individualized studies, clinical training, or research experience. Selections on basis of student interest, personal interview, and available resources. Possible subjects may include death and dying, suicide, medical ethics, depression, or other psychiatry and behavioral science interests of the student and available faculty.

411 **Introduction to Clinical Psychiatry** (2) **Hendren and Staff**
In-depth study of topics in psychiatry of interest to students. Students meet with faculty to discuss readings and research and, on occasion, interview patients in the hospital. Topics regularly include psychoanalysis, eating disorders, consultation-liaison, death and dying, child psychiatry, and a wide variety of other possibilities.

412 Application of Psychoanalytic Principles to the Practice of Medicine (1) Nowak
Special course designed for medical students by Extension Division of the Washington, D.C., Psychoanalytic Institute, taught by a practicing psychoanalyst on clinical faculty. Two- to 3-week advance notice required to arrange for an instructor.

413 Identity and Role of the Physician (1) Robinowitz
Emphasis on the role and identity of the physician (with special emphasis on women). Done in a small group in which didactic material on the role and identity of the physician is combined with experimental models, including group dynamics. Number and time of meetings flexible.

414 History of Mental Illness and Therapeutics (1) Gorelick
Consideration of the historical periods of primitive healing, Greek medicine, Arabic medicine, Christian healing, witchcraft, and key developments of the last 200 years. Student may select topic of particular interest for further study with supervisor.

415 Individual Student Preceptorship (1) Hendren and Staff
First- and second-year medical students can arrange individual preceptorships other than departmental electives listed with the permission of Dr. Hendren.

800 Summer Remedial: Medical Practice (3) Wiener

801 Summer Remedial: Conceptual Models (2) Wiener

Radiology

Chairman: R.M. Allman
Directors of Divisions: W.W. Olmsted *(Diagnostic Radiology)*, R.C. Reba *(Nuclear Medicine)*, C.C. Rogers *(Radiation Oncology and Biophysics)*

Courses numbered 40–195 are limited to students in the Associate in Science and Bachelor of Science degree programs in radiologic technology, nuclear medicine, and radiologic science and administration.

40 Clinical Training and Experience in X-ray Technology I (2) Sanford, Marriott
Instruction and close supervision in the use of radiologic techniques to examine the digestive, urinary, female reproductive, central nervous, and circulatory systems; chest and abdomen radiography, orthopaedic radiography, ENT and neurologic radiography, portable radiographic examinations, pediatric radiography, nuclear medicine, radiation therapy.

41 Clinical Training and Experience in X-ray Technology II (2) Sanford, Marriott
Prerequisite: Rad 40.

42 Clinical Training and Experience in X-ray Technology III (2) Sanford, Marriott
Prerequisite: Rad 40, 41.

43 Clinical Experience in Nuclear Medicine I (4) Cianci and Staff
Practical study and supervised performance; emphasis on indications and

contraindications, procedures and methods, physiological and procedural factors that may result in a false study, radiation safety techniques, preparation and development of new radiopharmaceuticals and research methodology, and administrative procedures.

44 **Clinical Experience in Nuclear Medicine II** (5) Cianci and Staff
Prerequisite: Rad 43.

50 **Radiographic Anatomy, Positioning II** (4) McDade, Kendrick
Human anatomy and positioning as applied to radiologic technology. Structure and function of the human skeleton and topographical anatomy, both normal and pathological. Applications of these techniques are practiced in the laboratory.

51 **Radiographic Anatomy, Positioning IV** (4) McDade, Monery
Basic positioning techniques, including upper and lower extremities, are studied in lecture periods. Application of these techniques in the laboratory, using radiographic machines, phantoms, and film processing methods.

55 **Imaging Procedures** (3) Embrey
Related anatomy, physiology, and pathology of imaging procedures; basic methodology of these and related procedures, including bone, brain, liver, liver function, bone marrow, lung, liver–lung, transmission, cardiac blood pool, cisternography, spleen, parathyroid, pancreas, lung ventilation, parotid ventriculography; miscellaneous scans; brain and cardiac flow studies.

56 **Hematologic and Radionuclide Dilution Procedures** (3) Williams
Related anatomy, physiology, and pathology of hematologic and radionuclide dilution procedures; basic protocol for these procedures, including plasma volume and related plasma studies, red cell volume and related red cell studies, studies of iron metabolism, and placental localization and scanning.

57 **Organ Concentration–Excretion Measurements** (3) Franco, Embrey
Related anatomy, physiology, and pathology of organ concentration–excretion measurements; procedure, including thyroid uptake and its variations, thyroid scan, metastatic chest survey, renogram, renal scan, and renal flow study.

58 **Gastrointestinal Absorption Measurements** (1) Messer
Related anatomy, physiology, and pathology of gastrointestinal absorption measurements; procedure, including fat absorption studies (triolein and oleic acid) and the three stages of the vitamin B-12 absorption study (Schilling test).

59 **Competitive Binding Radioimmunoassay** (2) Franco
Basic concepts of radioimmunoassay; basic procedure for any competitive binding radioimmunoassay. Specific concepts and procedure for T3, T4, and serum B-12 determinations; factors affecting those determinations and the interpretation of their results.

60 **Radiographic Technique** (4) Kaften, Krier
The history and development of X-rays and X-ray tubes and the prime factors affecting film quality. Lectures and laboratories on quality assurance. Course coordinated to provide knowledge and skills required to succeed in other technical courses.

61 **Radiographic Anatomy, Positioning III** (4) McDade, Kendrick
Techniques of radiography employing contrast media, fluoroscopy, spot films, body section radiography, pelvimetry, location of foreign body in the eye, and operating techniques. Prerequisite: Rad 60.

62 **Darkroom Procedures** (2) Johnson, Mowery
Processing of film after exposure; care and handling of conventional and automatic darkroom equipment; types of film, handling, and storage; mixing

and handling of chemicals and the action and quantity of these chemicals in the processing of film; effects of heat and cold on these chemicals, diagnosing improper developing techniques. Laboratory work.

65 **Basic Chemistry** (3) Messer
Introduction to basic chemistry: kinds of matter, atomic structure, the periodic table, chemical bonding, formulas and equations, solutions, acid-base reactions; introduction to organic chemistry and biochemistry; laboratory sessions.

66 **Radiopharmaceuticals** (3) Franco
Uses of radionuclides in medicine, basic principles of a Mo-99/Tc-99m generator, radiopharmaceuticals and their action within the body, preparation of radiopharmaceuticals using generator-produced nuclides, quality control, accountability, procurement, clinical orientation.

70 **Radiographic Physics I** (3) DeLeon, Napper
Fundamental concepts of physics, including standards of measure, metric measurement, laws of motion, weight, work, power, energy, and momentum. Introduction to structure of matter, atomic and nuclear structure, periodic tables, chemical bonding, material and artificial radioactivity, series decay. Description and use of electrostatics and magnetism. Laboratory work.

71 **Radiographic Physics II** (4) West, Treadwell
Fundamental concepts of current flow, ohms and Joule's law, series-parallel, compound circuits, battery types and functions, metering devices, electrical safety. Description and function of electromagnetism and induction, alternating current principles, AC cycle, induction and inductor, capacitance and capacitors, applications of electronic principles to X-ray equipment and components; transformers, generators, motors, rectifiers, current control devices, fuses, circuit breakers, magnetic relays, circuitry of fixed and mobile X-ray units. Laboratory work.

72 **Radiation Instrumentation** (5) Williams, Embrey
Theoretical and practical aspects of radiation detectors; types, components, and operation of detectors; collimators; geometry; introduction to rectilinear scanning; introduction to stationary imaging; clinical orientation.

75 **Fundamentals of Atomic and Nuclear Physics** (3) Franco
Basic units, quantum theory, Bohr theory, atomic and nuclear structure, radioactivity and decay, alpha and beta particles, electromagnetic radiation, series decay, radioactive equilibrium, I.C.R.U.

80 **Mathematics of Radiology** (3) DeLeon, Cook
Principles of mathematics as applicable to the physics of radiologic technology; use of logarithms, including multiplication, division, powers, and roots; scientific notation; geometry of the circle, square, and rectangle; basic trigonometric functions; linear equations in the unknown; Cartesian coordinate plane; slope of straight line; linear equations from given conditions; and graphic solution of two or more linear equations. For off-campus students only.

81 **Basic Mathematics** (3) Williams
Review of basic high school mathematics, basic algebra, common and natural logarithms and their manipulation, linear and logarithmic graphing, and manipulation of a log-log slide rule.

82 **Applied Technical Mathematics** (3) Messer
Mathematics as applicable to nuclear medicine. Basic decay formula and its variations, calculation of doses of radionuclides, basic statistics terminology, frequency distributions, confidence limits, standard error, efficient distribution of counting time, statistics relating to rectilinear and stationary imaging.

90 **Medical Ethics** (1) — Johnson, Cook
Ethics of physician/technician/patient relationships. Responsibilities, both moral and legal, to physician and patient; the rapport expected of the technologist.

91 **Special Projects in Radiology** (arr.) — Staff
Independent study on an aspect of radiology worked out between the student and the instructor. Students may register by petition only.

93 **Radiobiology and Radiation Dosimetry** (3) — Messer
Interaction of radiation with matter; radiation effects on molecular, cellular, tissue, and organ levels; genetic and somatic effects of ionizing radiation; classical and M.I.R.D. methods of absorbed dose calculation.

94 **Radiological Safety** (3) — Embrey
Introduction to radiation safety; units of radiation exposure and dose; licensing; NRC regulations; accountability and records, receipt, storage, handling, transportation, and disposal of radioactive materials; monitoring; shielding; dose–distance relationships; personnel dosimetry; radiation illness; radiac instruments; radiation safety clothing; radioactive "spill" procedure.

95 **Radiation Safety** (2) — Brockhaus, LaFontaine
Techniques and equipment design for reducing unnecessary radiographic exposure of the patient and technologist.

96 **Radiation Biology** (3) — Brockhaus, Krier
Effects of ionizing radiation on various cells, tissues, organs, and the human body as a whole; organic and inorganic molecules; the human immunity system; effects on pregnancy and relative radiosensitivity of the developing embryo; possible genetic effects of radiation; chronic and acute effects of radiation; use and history of radiation in therapy; classification of neoplasms, types of therapy units, and treatments. Prerequisite: Rad 50, 70, 71.

97 **Radiographic Anatomy, Positioning V** (4) — Turman, Mowery
Special radiographic procedures, including cerebral, abdominal, and cardiac angiography. Lecture and laboratory periods. Prerequisite: Rad 61, 71.

98 **Therapy Procedures** (1) — Williams
Introduction to radiation therapy and radium implants. Related anatomy, physiology, and pathology of phosphorous-32 and iodine-131 therapies and the technologist's responsibilities concerning them.

99 **Alternate Imaging Systems** (3) — Kaften, Krier
Various modalities of radiographic imaging systems and types of equipment. Intensification screens, fluoroscopy, spot filming, image intensification, cinefluoroscopy, film changes, thermography, electron radiography, and computerized axial tomography. Prerequisite: Rad 60, 71, 95.

100 **Pathology** (3) — Brockhaus, May
Radiographic pathology relevant to the radiologic technologist. Clinical description of the disease process and radiographic demonstrations.

130 **Mathematics of Radiology** (3) — McElroy
Principles of mathematics as applicable to physics of radiologic technology; use of exponential and logarithm function, including multiplication, division, powers, and roots; scientific notation; geometry of the circle, square, and rectangle; basic trigonometric functions, linear equations in the unknown; Cartesian coordinate plane; slope of straight line; and linear equations from given conditions. Usage and application of calculators is stressed.

140 **Radiology Administration** (4) — Pickwick, Busching
Key areas of administration; human skills, technical skills, and conceptual awareness as they pertain to radiologic management at the department level. Traditional management concepts and models developed through modern texts and current journals that address such topics as organizational

behavior, planning, and controlling. Discussion and exploration of the logistics of managing a radiology section. Prerequisite: HSA 142, 153, 154, 170.

145 Administrative Project: Diagnostic Radiology (3) Busching
For students concentrating in diagnostic radiology. Identification, development, and completion of a project for a radiology department, using administrative principles. Weekly seminars on current issues in management and leadership. To be taken with Rad 140.

147 Administrative Project: Nuclear Medicine (3) Busching
For students concentrating in nuclear medicine. Identification, development, and completion of a project for a nuclear medicine department, using administrative principles. Weekly seminars on current issues in management and leadership. To be taken with Rad 140.

149 Administrative Project: Radiation Therapy (3) Busching
For students concentrating in radiation therapy. Identification, development, and completion of a project for a radiation therapy department, using administrative principles. Weekly seminars on current issues in management and leadership. To be taken with Rad 140.

167 Radiation Physics and Safety I (3) Rosenstein
Concepts of matter and energy and electromagnetic radiation. Mechanisms in the production of X-rays and X-ray circuits, including half-wave and full-wave rectification and three-phase generators. Interaction of radiation with matter, emphasizing the photoelectric, Compton, and pair-production effects. Radiation detection and dosimetry; roentgen rad and rem units of radiation. Radiation safety as applied to diagnostic radiology, nuclear medicine, and radiotherapy, including effects of time, distance, and shielding. Maximum permissible concentrations, internal dose problems. Prerequisite: Rad 92.

171 Radiological Electronics and Engineering (3) McElroy
Introduction to basic electronics and the operation, limitations, use, and principles in the selection of instrumentation. Transistors, power supplies, amplifiers, major circuit components of radiation detection instruments, gamma camera and rectilinear scanners, radiotherapy orthovoltage and linear accelerators, and diagnostic radiography equipment. Prerequisite: Rad 130, CpMd 101.

175 Physics and Radiological Imaging (3) Staff
For students concentrating in diagnostic radiology. Image formation and transmission through radiological and related photo-optical devices, using system analysis techniques. Concepts of sensitivity, contrast, and modulation transfer functions. Description and analysis of photoreceptors, including film grids and Bucky and intensifier screens. Radiographic development process. Fluoroscopy, cineradiography, and video techniques, image storage, electronic radiography; and solid-state imaging panels. Ultrasonography and thermography. Demonstrations and experiments in control and evaluation of radiologic imaging. Prerequisite: Rad 167.

176 Physics of Nuclear Medicine (3) Staff
For students concentrating in nuclear medicine. Concepts of radioactivity, including beta decay, isomeric transitions, electron capture, internal transition, alpha decay, and the auger effect. Isotopic half-life secular and transient equilibrium. Artificial transmutations, nuclear reactions, counting statistics, and selection of instrumentation. Scintillation spectrometry techniques. Rectilinear scanners, gamma camera, and computer technology in nuclear medicine. Demonstrations and experiments in control and evaluation of imaging. Prerequisite: Rad 167.

177 Dosimetry in Radiation Therapy (3) Staff
For students concentrating in radiotherapy. Concepts of depth dose, isodose curves, and tissue air ratios for different energies, TSD, and field size

Techniques of treatment planning for stationary, multiple, and moving portals for Co-60 and megavoltage linear accelerators. Concepts of wedge fields and compensation for multiple TSD surfaces and tissue inhomogeneities. Dosimetry of linear sources. Quimby and Paterson Parker dosimetry systems. Computer techniques in radiotherapy. Introduction to the dosimetry of electrons, neutrons, and the heavy particles. Demonstrations and experiments illustrating dosimetric principles. Prerequisite: Rad 167.

180 **Special Project in Radiology** (arr.) Staff
For selected radiologic sciences and administration students who have completed the required course work but have failed to meet the required minimum quality point index in the core curriculum. Students may register by petition only.

190 **Radiation Biology** (2) Bradley
Radiation physics applied to biological systems; radiation chemistry of water and organic molecules; radiation effects on cells, tissues, and whole organisms; DNA damage, repair, carcinogenesis, and genetics. Risks vs. benefits; protection measures.

195 **Directed Study in Radiation Physics** (2) Staff
Projects, in selected specialty, demonstrating applications of radiation physics, imaging, or dosimetric principles to radiographic quality control and evaluation of radiological equipment systems. Prerequisite: Rad 167; 171; 175 or 176 or 177.

383 **Clinical Radiology** (5) Jacobs and Staff
For the initial portion of the course, students work in a simulated reading room with a number of faculty in a carefully organized review of the American College of Radiology learning file of radiographs. Thereafter, the student is assigned to rotate and observe various sections in the GWU Hospital Department of Radiology. Univ. Hosp.

385 **Nuclear Medicine** (arr.) Reba and Staff
Introduction to the application of radiotracer techniques in clinical medicine and biomedical research. Participation as clinical nuclear medicine intern or as research assistant. Student is encouraged to become involved with one of the research projects of the division or in an independent investigation oriented toward pharmaceutical chemistry, computer applications, or patient care. Univ. Hosp.

386 **Radiation Oncology** (arr.) Rogers and Staff
Introduction to radiation oncology, with particular attention to radiation medicine. Basic principles of radiation physics, biology, and therapy techniques within the format of clinical practice. Participation in patient management with a variety of malignant diseases will emphasize diagnosis, staging, and subsequent treatment alternatives. Univ. Hosp.

387 **Subspecialty Diagnostic Radiology** (arr.) Jacobs and Staff
Subspecialty training in radiological diagnosis to prepare students for specialty medical training. Offerings include pulmonary, gastrointestinal, urologic, obstetric and gynecologic, and neurologic subspecialties. Prerequisite: permission of department. Univ. Hosp.

390–92 **Extramural Radiology Elective** (arr.)
Participation in a radiology program at another institution; dependent on written acceptance of the student by the chairman of the extramural Department of Radiology and with confirmation by the Education Director, Department of Radiology, GWU Medical Center.

400 **Diagnostic Radiology** (arr.) Staples and Staff
General radiography, fluoroscopy and nuclear medicine, special procedures, ultrasound and/or CT. Review and study of teaching image file. Wash. Hosp. Center.

401 Diagnostic Radiology (arr.) Hage
Participation in general radiologic interpretation, nuclear radiology, specia procedures, ultrasound, and CT. Review and study of teaching file. Dai conferences. Walter Reed Army Med. Center.

402 Reading Chest Films (3) Jacob
A two-week radiology elective with the goal of improving the physician's understanding of radiographic principles and diagnostic approaches. Focus on chest films.

403 Reading Bone Films (3) Jacob
A two-week radiology elective with the goal of improving the physician's understanding of radiographic principles and diagnostic approaches. Focus on bone films.

Surgery

Chairman: R.G. DePalma
Directors of Divisions: P.E. Shorb, Jr. *(General Surgery)*, W.R. Wilson *(Otolaryngology)*, J.G. Randolph *(Pediatric Surgery)*, M.H. McGrath *(Plastic Surgery)*, B.L. Aaron *(Thoracic and Cardiovascular Surgery)*

303 Clinical Clerkship (10) Hix
Required for medical students. Eight weeks at Univ. Hosp. and Nat'l. Naval Med. Center.

351 Otolaryngology, Head, and Neck Surgery (arr.) Hauck and Staff
Participation in the clinical service at Walter Reed Army Medical Center, involving inpatients and outpatients.

352 Otolaryngology (arr.) Rish and Staff
Inpatient and outpatient rotations; operating room experience. Nat'l. Naval Med. Center.

353 Otolaryngology, Head, and Neck Surgery (arr.) Wilson, Gulya
Work-up and care of clinical and hospitalized patients. Participation in surgery and ER consultations. This course partially fulfills the surgical subspecialty requirement if the student did not have an ENT experience during the third-year surgery clerkship.

376 Advanced Surgery (5) Tsangaris
Participation in total patient care, including operative procedures under close supervision.

378 Intensive Care Unit (5) Fouty and Staff
Introduction to the management of acutely ill surgical patients, including cases involving trauma; neurosurgery; and cardiovascular–thoracic, abdominal, and orthopaedic surgery. Wash. Hosp. Center.

379 Transplantation Immunology (arr.) Karmi
Clinical renal transplantation and preservation. Daily teaching rounds, literature conference, seminar presentation, weekly surgical–medical nephrology rounds. Univ. Hosp.

383 Endocrine Surgery (arr.) Geelhoed
Management of endocrine disorders. Emphasis on control of hyperfunction and neoplasms of the thyroid, parathyroid, adrenal, and pancreatic islet cell glands. Videotaped classic endocrine problems, library and laboratory re-

search, and clinical exposure to surgical endocrinology. Univ. and V.A. Hosps.

384 **Thoracic/Cardiovascular Surgery** (5) Aaron, Hix
Basic principles used in thoracic and cardiovascular surgery. 4-week elective periods. Univ. Hosp. and Clinic.

385 **Plastic and Reconstructive Surgery** (arr.) McGrath
Experience in the full spectrum of reconstructive surgery in both pediatric and adult age groups, including congenital anomalies, cosmetic surgery, neoplasms of the head and neck, facial trauma, benign and malignant skin lesions, hand surgery, burns, microsurgery, breast surgery. Responsibilities in the operating room, at the bedside, and in the clinic are combined with participation in a busy conference schedule and daily contact with all of the subespecialty resident and faculty members. Children's Hosp.

389 **Surgical Preceptorship** (arr.) Tsangaris
Care of general surgical patients as seen in private practice. Arranged in consultation with department chairman.

390–95 **Extramural Surgery Elective** (arr.)
The department arranges for students to spend one or more elective periods at other institutions. Students must have the approval of the chairman of the department.

400 **Special Programs** (arr.) Tsangaris
Special elective to be developed and arranged in consultation with department faculty.

401 **Peripheral Vascular Surgery** (arr.) Keshishian and Staff
Introduction to the physiologic basis for an approach to peripheral vascular disease. Initial assignment to the chief cardiovascular technician in the noninvasive laboratory. Modern diagnostic techniques, including observations of contrast arteriography. Following a patient from admission, through surgery, and into the postoperative period. Opportunity to participate in course director's private office practice. Wash. Hosp. Center.

402 **Burns** (arr.) Jordan
Participation in a nine-bed dedicated burn intensive care unit with an associated rehabilitation unit for recuperating burn patients; 100 major burn patients and 200 minor/rehab/reconstructive patients admitted to burn center every year. Full-time attending.

403 **Peripheral Vascular Surgery** (5) Giordano and Staff
General introduction to peripheral vascular surgery. Time spent in Vascular Laboratory, evaluating patients and learning the basic arteriovenous and cerebrovascular examinations, and in office practice of Dr. Joseph Giordano and Dr. Hugh H. Trout, seeing vascular patients. Assignment to one of the surgical services, participating in management and care of patients and attending to them in the operating room, if appropriate, including general vascular and surgical patients.

404 **Experimental Surgery** (arr.) Geelhoed
Research projects in surgical research laboratories, employing animal models and experimental operative procedures in physiologic investigations. Emphasis on design of experiments, performance of experimental surgical techniques, precision in laboratory data gathering, and analysis of data. Areas of investigation include surgical endocrinology, transplantation, and cardiovascular physiology.

405 **Hand Surgery Clinic** (arr.) Seyfer
Participation in care of patients of all ages, working closely with hand surgeons from Orthopaedic and Plastic Surgical Services. Basic approaches to diagnosis and treatment of a wide variety of hand disorders, including nerve injuries, arthritic conditions, congenital anomalies, fractures, vascular

problems, and reconstructive techniques for these problems. Exposure to microsurgery. Participation in clinics, conferences, ward rounds, and operating room. Walter Reed Army Med. Center.

Seyfer

406 **Plastic Surgery Clinic** (arr.)
Participation in care of patients and exposure to a wide variety of surgical problems in all age groups, ranging from congenital anomalies such as cleft lip/palate and syndactyly to complex reconstructive surgery for abdominothoracic wall defects, head and neck cancer, and extremity reconstruction. Cosmetic surgery involving face, eyelids, and other areas. Participation in combined orthopaedic/plastic surgery hand service. Experience in evaluation and treatment of conditions related to the upper extremity. Research opportunities. Assist in microsurgical laboratory on a regular basis. Walter Reed Army Med. Center.

Urology

Chairman: H.C. Miller, Jr.

Karmi

302 **Clinical Clerkship** (3)
Observation of urologic conditions and procedures for diagnosis and treatment. Radiologic and pathologic studies; endoscopy and surgery; collateral reading; weekly staff conference. Univ., V.A., Fairfax, and Children's Hosps.

Karmi and Staff

381 **Clinical Urology** (5)
Observation of urologic conditions and procedures for diagnosis and treatment. Radiologic and pathologic studies; endoscopy and surgery; collateral reading; weekly staff conference. Univ., V.A., Children's and Fairfax Hosps.

Bensimon and Staff

382 **Clinical Urology** (arr.)
Observation of urologic conditions and procedures for diagnosis and treatment. Radiologic and pathologic studies; endoscopy and surgery; collateral reading, weekly staff conference. V.A. Hosp.

390–92 **Extramural Elective** (arr.)
With permission the student can participate in a (reviewed) urology clerkship in another medical center.

Faculty and Staff of Instruction*

Emeriti

Theodore Judson Abernethy, *Professor Emeritus of Clinical Medicine*
B.S. 1925, Denison University; M.D. 1929, Johns Hopkins University

Louis Katz Alpert, *Professor Emeritus of Medicine*
B.S. 1928, M.D. 1932, Yale University

Seymour Alpert, *Professor Emeritus of Anesthesiology*
B.A. 1939, Columbia University; M.D. 1943, State University of New York Downstate Medical Center

William Staton Anderson, *Professor Emeritus of Clinical Child Health and Development*
B.A. 1927, Duke University; M.D. 1931, Johns Hopkins University

Robert Henry Barter, *Professor Emeritus of Obstetrics and Gynecology*
B.S. 1937, M.D. 1940, University of Wisconsin

Thomas McPherson Brown, *Professor Emeritus of Medicine*
B.A. 1929, Swarthmore College; M.D. 1933, Johns Hopkins University

Paul Calabrisi, *Professor Emeritus of Anatomy*
B.A. 1931, Catholic University of America; M.A. 1940, George Washington University; Ph.D. 1955, Cambridge University

Charles Seymour Coakley, *Professor Emeritus of Anesthesiology*
M.D. 1937, George Washington University

Leon Richard Culbertson, *Professor Emeritus of Urology*
B.S., M.D. 1936, University of Virginia

Henry Lauran Darner, *Professor Emeritus of Clinical Obstetrics and Gynecology*
B.A. 1916, Western Maryland College; M.D. 1920, Johns Hopkins University

Samuel Mayer Dodek, *Professor Emeritus of Clinical Obstetrics and Gynecology*
B.A. 1923, George Washington University; M.D. 1927, Thomas Jefferson University; M.A. 1931, Case Western Reserve University

William Rankin Duryee, *Research Professor Emeritus of Pathology (Experimental)*
B.A. 1927, Ph.D. 1933, Yale University

James Albert Dusbabek, *Professor Emeritus of Clinical Obstetrics and Gynecology*
M.D. 1934, George Washington University

Clayton Bernard Ethridge, *Professor Emeritus of Medicine*
M.D. 1933, University of Virginia

John McCallum Evans, *Professor Emeritus of Medicine*
B.A. 1935, Denison University; M.D. 1939, State University of New York at Buffalo

James Joseph Feffer, *Professor Emeritus of Clinical Engineering and of Medicine*
B.A. 1935, Indiana University; M.D. 1938, Indiana University at Indianapolis

Clarence Kendall Fraser, *Professor Emeritus of Clinical Obstetrics and Gynecology*
Ph.B. 1931, College of the Holy Cross; M.D. 1935, Tufts University

James Quincy Gant, Jr., *Professor Emeritus of Clinical Dermatology*
B.A. 1930, M.S. 1931, Ohio State University; M.D. 1935, Medical College of Virginia of Virginia Commonwealth University

*The Faculty and Staff of Instruction listed here by department represent appointments current as of March 1, 1985. Faculty and staff members who hold appointments in two or more departments have the department of primary responsibility listed first.

Robert Henry Groh, *Professor Emeritus of Clinical Neurology*
B.S. 1935, M.D. 1937, University of Pittsburgh

Clarence Richard Hartman, *Associate Professor Emeritus of Microbiology*
B.A. 1933, M.D. 1936, George Washington University

Roy Hertz, *Research Professor Emeritus of Pharmacology*
B.A. 1930, Ph.D. 1933, M.D. 1939, University of Wisconsin; M.P.H. 1940, Johns Hopkins University

Robert Sexton Higdon, *Professor Emeritus of Dermatology and of Child Health and Development*
B.S. 1933, Millsaps College; M.D. 1937, Tulane University

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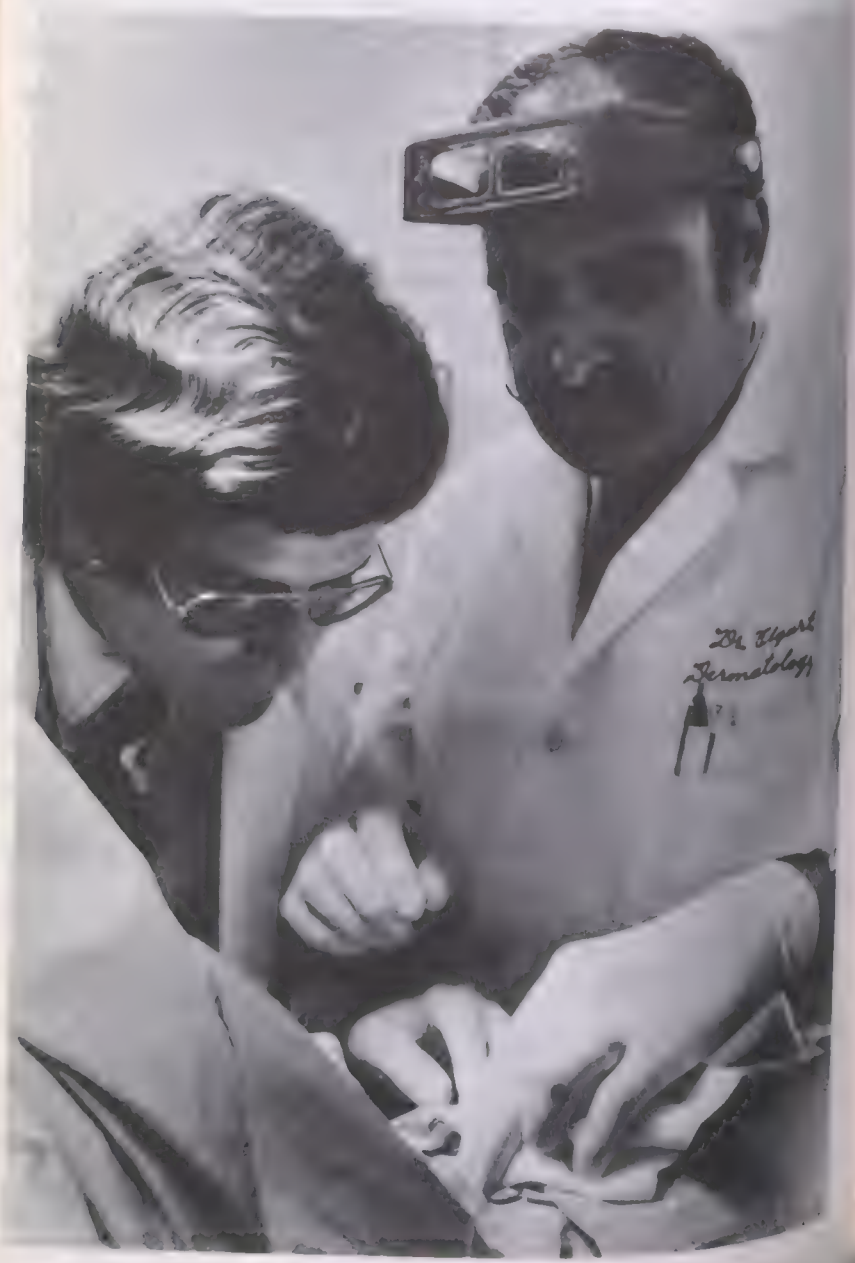
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Graduate School of Arts and Sciences, 1893

School of Medicine and Health Sciences, 1825

National Law Center, 1865

School of Engineering and Applied Science, 1884

School of Education and Human Development, 1907

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Division of Continuing Education, 1916/1930/1981

University Hospital, 1898

Colleges and Schools—Degree Programs

Columbian College of Arts and Sciences: Associate in Arts (A.A.), Associate in Arts in General Studies (A.A. in Gen.Std.), Bachelor of Arts (B.A.), Bachelor of General Studies (B.Gen.Std.), Bachelor of Music (B.Mus.), and Bachelor of Science (B.S.)

Graduate School of Arts and Sciences: Master of Arts (M.A.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (Mus.M.), Master of Science (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of Science in Forensic Science (M.S.F.S.), Master of Philosophy (M.Phil.), and Doctor of Philosophy (Ph.D.)

School of Medicine and Health Sciences: Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), and Doctor of Medicine (M.D.)

National Law Center: Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) (M.Comp.L. [Am.Prac.]), and Doctor of Juridical Science (S.J.D.)

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School of Education and Human Development: Bachelor of Arts in Education and Human Development (B.A. in Ed.&H.D.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education and Human Development (M.A. in Ed.&H.D.), Master of Arts in Teaching (M.A.T.), Education Specialist (Ed.S.), and Doctor of Education (Ed.D.)

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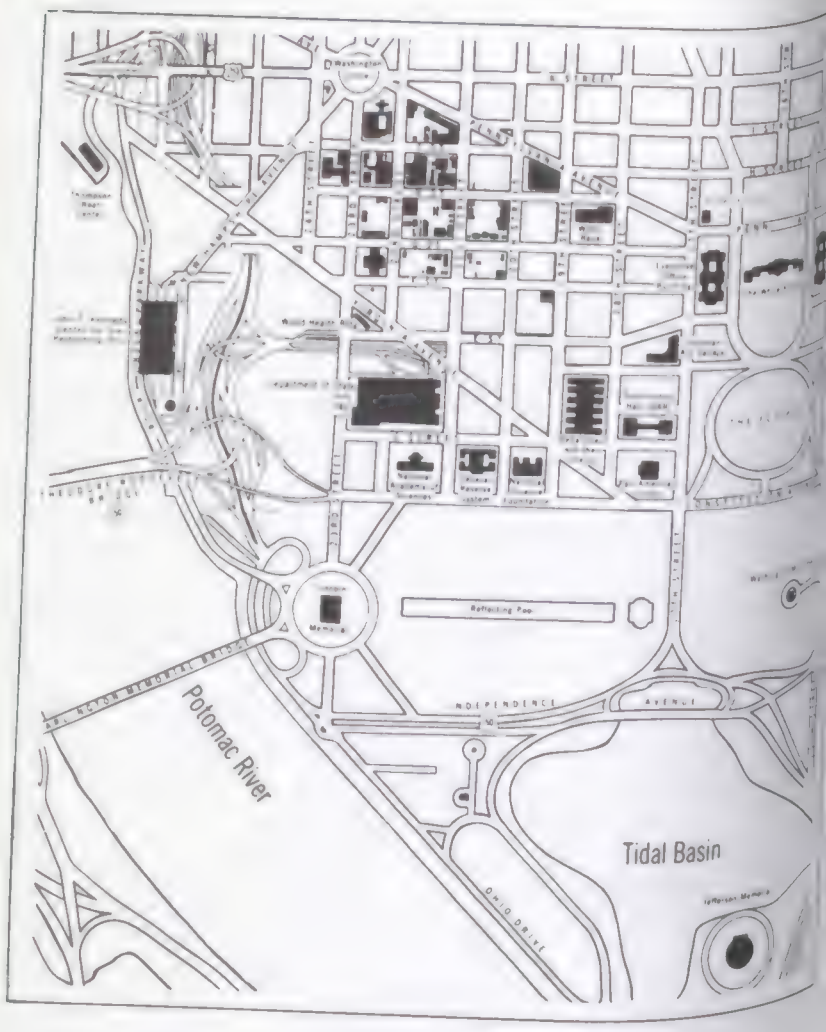


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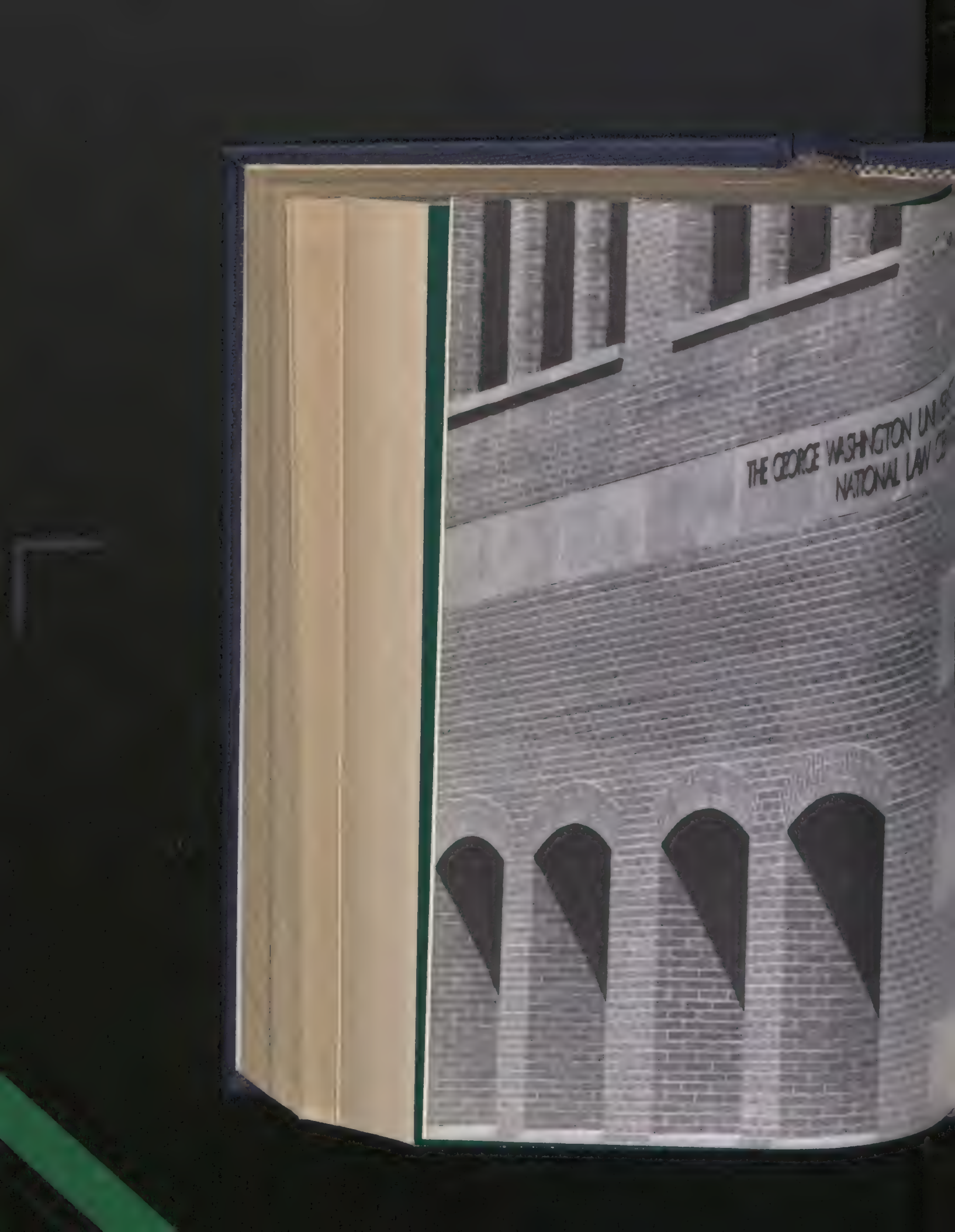
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1985-1986

Washington, D.C. 20052


THE GEORGE WASHINGTON UNIV
NATIONAL LAW C



TO PROSPECTIVE STUDENTS

This Bulletin of the George Washington University National Law Center contains general information about such matters as admission, registration, fees, and financial aid, as well as a listing of our faculty and courses of instruction. We are one of the nation's large law schools. But, nonetheless, there always has been a tradition of friendliness among our students and an attitude of accessibility on the part of our faculty. If you join us as first-year students, you will discover that the first-year life of the school is an intense one. Each of the sections into which the first-year class is divided becomes a little community of its own with a camaraderie and esprit de corps that will make that first year one of the most vivid of your lives.

The National Law Center is an institution that is characterized by the richness and diversity of its programs. Whether you are joining us as a J.D. student or an LL.M. student, your time here will be one of intellectual growth. In your upper-class years, you may choose to take one of the many courses and programs in fields such as Constitutional Rights, Administrative Law, Government Contracts, International Law, Labor Law and Antitrust Law, Land Development Law, Patent Law, or Taxation, which have given this school its reputation as a center for study and research in public law. Graduate students may choose to specialize in one of the areas just mentioned. As J.D. students in your upper-class years, you might also choose to direct your energies to the School's varied and intense programs in Clinical Law. The class entering the National Law Center in the fall of 1985 should find its years here particularly memorable. A $16.7 million expansion program of the physical facilities of The National Law Center is now completed. The program encompassed a major renovation of Stockton Hall and the Jacob Burns Law Library, tying them to an impressive new classroom building, Lerner Hall, to the north and a handsome addition to the Jacob Burns Law Library to the south.

As is evident, The National Law Center is a large and dynamic place, but we believe it is a community. We hope that you will aspire to join us and become a part of that community.

Cordially,

Jerome A. Barron

Jerome A. Barron
Dean

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1985 SUMMER TERM

May 20 Registration for all sessions *Monday* (noon–6:30 p.m.)
Application for September graduation due as part of registration
First-session and 13-week session classes begin
May 27 Holiday *Tuesday*
June 28 First-session classes end *Friday*
July 1–2 First-session examination period *Monday–Tuesday*
July 4 Holiday *Thursday*
July 8 Registration *Monday* (9:30 a.m.–2 p.m. and 4–6 p.m.)
Application for September graduation due as part of registration
Second-session classes begin
August 15 Last day of classes *Thursday*
August 16, 19–20 Second-session and 13-week session examination period *Friday, Monday–Tuesday*

*The Academic Calendar is subject to change

1985 FALL SEMESTER

August 22–23	Registration *Thursday* (12:30–7 p.m.) and *Friday* (3–7 p.m.) Application for February graduation due as part of registration
August 26	Classes begin *Monday*
September 2	Labor Day (holiday) *Monday*
October 11	S.J.D. dissertations of February candidates due *Friday*
November 27	Thanksgiving recess begins after last class *Wednesday*
December 2	Classes resume *Monday*
December 6	Last day of fall-semester classes *Friday* LL.M. theses of February candidates due
December 7–20	Reading and examination period

1986 SPRING SEMESTER

January 6–7	Registration *Monday* (12:30–7 p.m.) and *Tuesday* (10 a.m.–2 p.m.) Application for May graduation due as part of registration
January 8	Classes begin *Wednesday*
January 20	Martin Luther King Day (holiday) *Monday*
January 24	S.J.D. dissertations of May candidates due *Friday*
February 16	Winter Convocation *Sunday*
February 17	George Washington's birthday observed (holiday) *Monday*
March 1	Completed applications for 1986–1987 teaching fellowships due
March 15	Spring recess begins after last class *Saturday*
March 24	Classes resume *Monday*
April 25	LL.M. theses of May candidates due *Friday* Last day of spring-semester classes *Friday*
April 26–May 9	Reading and examination period
May 18	Commencement *Sunday*

THE NATIONAL LAW CENTER

HISTORY

The Law Center, the oldest law school in the District of Columbia, was established in 1865 with a formal program of two years of study. This was largely through the efforts of the Reverend Whitefield Samson, President of Columbian College, whose action resulted in the purchase of a separate building for holding law classes. The building had belonged to Trinity Church, of which Francis Scott Key had been Senior Warden. It was occupied by the Law Center until 1884.

Sixty graduates, from 22 of the then 37 states, received degrees in 1867. The school continued to have a student body and a faculty that reflected the fact that it was at the seat of our nation's government. Associate Justices David J. Brewer and John Marshall Harlan of the Supreme Court of the United States were among the prominent members of the bench and bar who were on the faculty.

In 1877, one year after the first such program was adopted in the United States, the Law Center instituted a course leading to the degree of Master of Laws. In 1898, the course of instruction for the degree of Bachelor of Laws was extended to three years. The Law Center took part in 1900 in the organization of the Association of American Law Schools.

In the past quarter-century the Law Center expanded its course and seminar offerings with consideration of the needs of first-degree and graduate students. The degree of Doctor of Juridical Science was instituted in 1940. The need of foreign lawyers who came to this country and who required additional preparation for law work in the United States resulted in the creation of programs for the degrees of Master of Comparative Law in 1946 and Master of Comparative Law (American Practice) in 1951.

In 1954, National University School of Law, which had an important place in legal education in the District of Columbia since 1869, was absorbed by the George Washington University Law School.

Since 1954, programs of special research and study have enriched the basic curriculum. At present these include Taxation; Labor Law; Environmental and Energy Law; Patent Law; International and Comparative Law; and Government Contracts. The academic courses reflect the breadth in public law for which the Law Center is well known.

Additionally, the Law Center has been a leader in developing a curriculum to meet the legal needs of the poor and the disadvantaged. A clinical law program has been developed which is the equal of that at any law school in the nation. Special projects include the Consumer Protection Center, the Community Legal Clinic, Clinical Studies in Environmental Law, Students in Court, and individual projects supervised by the Law Students Civil Rights Research Council.

Realizing the need for legal services for all members of society, the National Law Center, while maintaining its strong course offerings in patent law, administrative law, taxation and government contracts, has developed a rich selection of courses, traditional and clinical, oriented toward the needs of the poor, the elderly, and the consumer.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the

University, including admission to educational programs and employment
University is also subject to the District of Columbia Human Rights Law

Inquiries concerning the application of this policy and federal laws
regulations concerning discrimination in education or employment progra
and activities may be addressed to Dr. Marianne Phelps, Associate Pro
George Washington University, Rice Hall, Washington, D.C. 20052, or to
Assistant Secretary for Civil Rights of the Department of Education.

LOCATION IN THE NATION'S CAPITAL

Of special significance is the location of the National Law Center in the nati
capital, the focal point of the law in action, both American and international
work of the Center goes on in this environment, presenting a unique opportu
for observation and study of federal agencies—judicial, legislative, and admin
trative. Readily accessible are the Supreme Court of the United States, the fe
trial and appellate courts of the District of Columbia, and federal courts of spec
jurisdiction, such as the United States Court of Appeals for the Federal Circu
the United States Tax Court, and the Court of Military Appeals. Current federa
legislation can be studied as it is considered by Congressional committees and
it comes up for debate on the floors of the House of Representatives and the
Senate. With respect to the federal administrative agencies, students here
Washington have matchless opportunities for study and observation. They ca
attend informal and formal hearings of these agencies and can obtain from th
docket sections complete records of administrative adjudication in specific cases
Illustrative of such federal agencies are the Interstate Commerce Commission
the field of transportation; the Federal Trade Commission in the field of trad
regulation; the Securities and Exchange Commission in the field of securit
issues and corporate finance; the National Labor Relations Board in the field o
labor-management relations; the United States Patent Office in the field of pate
law; the Federal Energy Regulatory Commission in the field of water, natural ga
and electric power; and the Federal Communications Commission in the field o
radio and television.

Supplementing these environmental advantages of law in action are the
exceptional research library collections in the Library of Congress, in the various
departments of the federal government, and in the libraries of the headquarters of
national and international organizations. The notable library of the Carnegie
Foundation for International Peace has been acquired by George Washington
University for use of research students in international and comparative law
fields with respect to which Washington has come to be called "The Capital of the
World."

The years of residence at law school are years of participation in the life of the
community, which in the case of the George Washington University National Law
Center is the government of the United States. As a consequence, the study of law
takes on added meaning, whether the goal be government service or practice
general or specialized, and whatever the community in which the student plans
to practice.

ENRICHMENT PROGRAM

The Law Center supplements and enriches its diverse law programs by bringing
to the school eminent legal scholars, judges, distinguished members of the bar,
members of Congress, and high-level government officials to offer lectures and
informal seminars with students and faculty. Participants in the Enrichment
Program have included Mayor Henry Cisneros of San Antonio, Texas, Ambassa-
dor Elliot Richardson, Solicitor General Rex Lee, columnist Anthony Lewis,
Treasury Secretary Donald Regan, FBI Director William Webster, U.S. Court of



ppeals Judge Patricia Wald, and Stanford University Law Professor Barbara Babcock. The Enrichment Program, funded largely by gifts from alumni and friends of the Law Center, includes several endowed lectureships and a visiting scholar program.

OBJECTIVES

The purpose of the National Law Center is to prepare men and women to meet the needs of society in many fields of law and to encourage scholarly research and writing in the law. As a national law school, the Center does not emphasize any particular geographic area in its instruction; therefore, it prepares students to practice law in any part of the country. The Center also offers a program of legal education for foreign students. The Law Center seeks to fulfill these objectives through: (1) a rich and varied curriculum taught by eminent professors and highly qualified specialized instructors; (2) an extensive clinical law program in which students learn legal skills by actual practice; (3) two law journals which specialize in public law and international law; (4) trial practice; (5) participation in the Van Vleck Appellate Case Club and several other moot court competitions; (6) a series of student professional co-curricular activities; (7) studies on an advanced level for foreign as well as for American students; (8) a continuing legal education program for members of the bar, providing them with opportunities for course work within the curriculum; and (9) scholarly research and writing in the law.

NATIONAL LAW CENTER COMPLEX

$16.7 million expansion program of the physical facilities of the National Law Center has been completed. The new complex includes the new teaching facility Jacob Burns Law Hall, a completely renovated Stockton Hall, and the expanded Jacob Burns

Law Library. The facade of the new National Law Center is imagina
integrates a collection of dissimilar buildings into a visual unit. The Ce
become a positive addition to the campus, the street, and the neighbo

Lerner Hall

Theodore N. Lerner Hall is one of the most modern and innovative law
facilities in the nation. Its five levels contain eight major classrooms, th
suite, and the Moot Court room. Four of the classrooms are constru
amphitheater style and provide a full range of vision from any seat in th
The amphitheater classrooms are equipped with the most advanced
systems and have full video and viewing capacities.

Lerner Hall is a contemporary version of Victorian architecture. It ha
described by the *The Washington Post* as "a progressive piece of architec
urban design."

Stockton Hall

The newly renovated Stockton Hall contains administrative offices, s
lounges, and legal clinics. It also holds a reading room, media center, classr
and faculty offices.

The Jacob Burns Law Library

The parameters of the Jacob Burns Law Library have been thoroughly alter
the building expansion. The collections, study areas, and library administr
offices are now located on five instead of eight floors, and a large readin
spanning the entire second floor of Stockton Hall connects Lerner Hall dire
the library. The number of study spaces, at library tables and carrels and in
study rooms and cubicles, has been greatly increased, and lounge areas
available within and close to the library.

The use of a law library is inherently different from the uses of most o
libraries. A law library is often likened to the scientist's laboratory. Many
books are used briefly on the premises rather than checked out for th
reading. Law students spend many of their waking hours in the library, o
books or other research facilities. Care has therefore been taken in maki
Jacob Burns Law Library not only efficient but beautiful and comfortable.

The collection numbers well over 300,000 volumes. It contains a compre
sive research library, often in multiple copies, of Anglo-American law, inclu
the annotated statutes of the federal government, the 50 states, the territo
and other common-law countries as well as the reported decisions of all fe
jurisdictions in all editions. The library is especially strong in administrative
regulatory material and congressional coverage. It was designated a United S
Government Depository Library in 1978 and is, through this program, acquirin
substantial government documents collection.

The extensive treatise collection covers not only the field of law but al
related disciplines such as business, finance, economics, labor relations, soci
gy, criminology, psychology, political science, biography, foreign affairs, envi
mental studies, and others. Especially strong collections are maintained in t
law, labor law, intellectual property law, and international law. A large portio
the holdings of the former Library of the Carnegie Endowment of Interna
Peace, acquired by the University in 1950, is located in the library. An
especially rich component is the periodical collection. A growing proportion
these research materials is collected in a variety of microformats or on-line
videotapes. In addition to these materials available in-house, the library pro
access to almost unlimited information sources of a legal or law-related
through the various computer databanks to which it subscribes, such as
WESTLAW, ELSS (Electronic Legislative Search System), Legi-Slate, Dialog
Nexis.

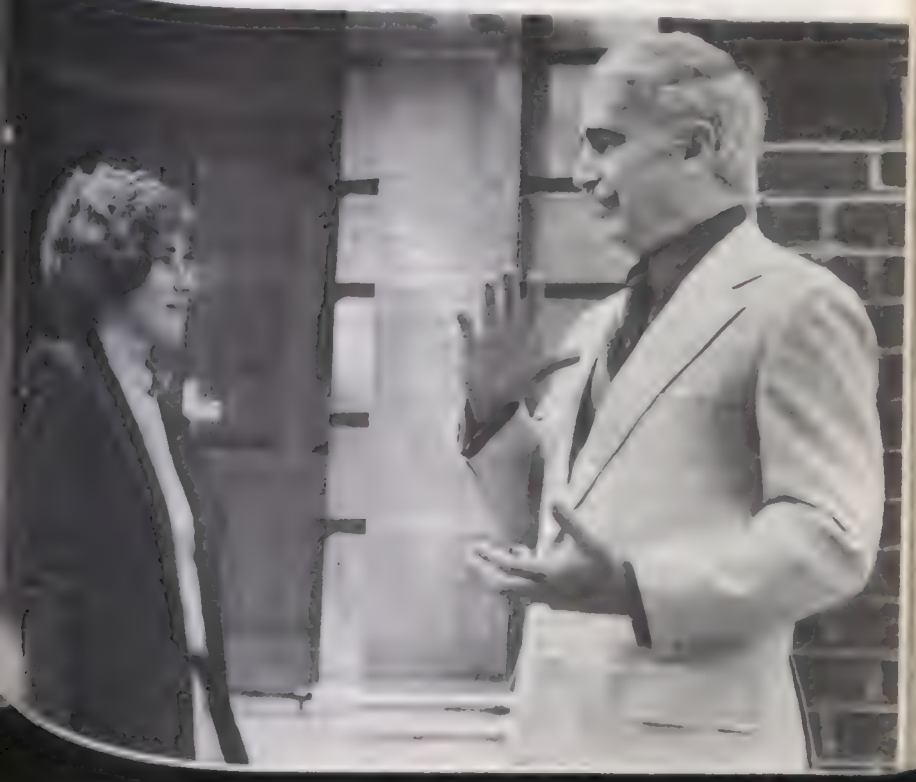
A permanent staff of 24 persons and many part-time employees administers and maintains the library and offers information, instruction, and other research support services. *Jacob Burns Law Library Readers' Guide*, available at the information desk, lists library services, hours of operation, collection locations, and other library-related information.

Beyond the resources of the Jacob Burns Law Library, GWU law students have access to the George Washington University Library (Gelman), the Medical Library (Himmelfarb), and other famous libraries in the District of Columbia, including the Library of Congress.

THE JURIS DOCTOR DEGREE PROGRAM

ENTRANCE REQUIREMENTS

For information on application for admission to the Juris Doctor degree program, see Admission under General Information. Admission to candidacy for the degree of Juris Doctor requires a Bachelor of Arts or equivalent degree from an accredited college or university, a satisfactory quality of work, and an acceptable distribution of courses. Any substantial number of hours taken on a pass-fail or other ungraded basis may be seriously detrimental to an applicant's chances for admission. Eligibility is based on personal and scholastic records and on the result of the Law School Admission Test. Personal recommendations by the faculty as well as the benefits the school derives from social, ethnic, cultural, and geographical diversity among its students, are considered. No applicant will be acceptable in transfer who is ineligible to return in good standing to a previously attended law school. From the applicants, a selection is made by the Committee on Admissions.



Information concerning the Law School Admission Test may be obtain the Admissions Office of the National Law Center or from the Law Admission Services, Box 2000, Newtown, Pa. 18940. The test is administ various centers in the United States. Testing dates are usually in O December, February, and June. Completed application forms and fees m received by the Law School Admission Services at least four weeks before th of the test. It is not necessary that formal application for admission be mad to taking the test.

Advanced Standing

In unusual circumstances, advanced standing toward the degree of Juris D may be granted for work of high quality successfully completed in othe schools that are members of the Association of American Law Schools a approved by the American Bar Association. Transferred credits will no recognized in excess of those which might be earned in a similar period o National Law Center.

Advanced standing will not be granted for law work already counted to the Bachelor of Arts or other pre-legal degree.

TUITION DEPOSIT

Every student admitted to the National Law Center as a candidate for the deg of Juris Doctor must submit a nonrefundable tuition deposit ($100 initially $350 later) after receipt of notification of acceptance. This deposit is credi toward tuition.

PROFILE OF THE ENTERING CLASS, FALL 1984

A first-year class of approximately 450 students was selected from more th 5,000 applicants from more than 700 colleges and universities. Applications received from every state in the union. Forty-five percent of the first-year cl were women.

The following colleges and universities are each represented by three or mor members of the first-year class: American University, Boston College, Bosto University, Brandeis University, Brown University, Bucknell University, Cathol University, College of the Holy Cross, Columbia University, Cornell Univers Duke University, Emory University, Franklin and Marshall College, George Wash ington University, Georgetown University, Howard University, Indiana Universit Johns Hopkins University, Michigan State University, New York University, Nort western University, Pennsylvania State University, Providence College, Purdu University, Rutgers—The State University, State University of New York at Alban Syracuse University, Tufts University, Tulane University, Union College, New York), University of California at Berkeley, University of California at Los Angeles University of California at Santa Barbara, University of Chicago, University Colorado, University of Delaware, University of Florida, University of Georgia University of Hawaii, University of Illinois, University of Kansas, University Maryland, University of Massachusetts, University of Michigan, University Notre Dame, University of Pennsylvania, University of Pittsburgh, University Rochester, University of Texas, University of Vermont, University of Virginia, University of Wisconsin, Vanderbilt University, Villanova University, and Washing ton University.

THE CURRICULUM

The curriculum for the degree of Juris Doctor at the National Law Center offe the candidate one of the largest and most varied selections of courses in the

country. First-year students are required to take Civil Procedure; Constitutional Law; Contracts; Criminal Law and Procedure; Legal Research and Writing; Moot Court; Property; and Torts. These courses give students the basis upon which all further legal study is built. In the second and third years of study, students must take Evidence and Professional Responsibility and Ethics and must fulfill a two-credit legal writing requirement.

All entering first-year students are required to take one of the following legal perspective courses during their program of study: American Legal History; Comparative Labor Law Seminar; Comparative Law; The Crime Lab, the Forensic Scientist, and the Criminal Lawyer; Jurisprudence; Law and Criminology I or II; Law and Medicine; Law and Psychiatry; The Legal Process; Science and the Legal Process; United Nations Law and World Order.

Beyond these requirements students are free to choose from the many course and project offerings. The Law Center prides itself on allowing students freedom to design their own program of study.

The curriculum is organized so that students may begin the study of law for the Juris Doctor degree only at the start of the fall semester. Transfer students may enter at the start of the spring semester also.

Students entering the National Law Center in 1985–1986 will follow the schedule set forth below.

DAY DIVISION

First Year

Fall Semester		Spring Semester	
Contracts I	4	Contracts II	2
Torts	4	Property	4
Criminal Law and Procedure	4	Constitutional Law	4
Legal Research and Writing	2	Civil Procedure	4
		Moot Court	1
Total semester hours	14	Total semester hours	15*

Second Year

Fall Semester		Spring Semester	
Elective	14	Evidence	4
		Elective	10
Total semester hours	14	Total semester hours	14

Third Year

Fall Semester		Spring Semester	
Elective	12	Elective	14
Legal writing requirement	2		
Total semester hours	14	Total semester hours	14

Professional Responsibility Requirement

Professional Responsibility and Ethics	1

*Students may elect to take 13 hours in one of their upper-class semesters.

†This requirement may be satisfied by service on the *Law Review*, by service on the *Journal of International Law and Economics*, by satisfactory completion of a seminar and other courses that require research paper, by participation in upper-class Moot Court, or by satisfactory completion of Law 314, Legal Writing.

‡Required prior to graduation for all students entering in the fall 1983 semester and thereafter. May be taken in the second, third, or fourth year.

EVENING DIVISION

First Year

Fall Semester		Spring Semester	
Contracts I	4	Contracts II	
Torts	4	Criminal Law and Procedure	
Legal Research and Writing	2	Civil Procedure	
Total semester hours	10	Total semester hours	

Second Year

Fall Semester		Spring Semester	
Property	4	Constitutional Law	
Elective	6	Moot Court	
		Elective	
Total semester hours	10	Total semester hours	

Third Year

Fall Semester		Spring Semester	
Elective	8	Evidence	
*Legal writing requirement	2	Elective	
Total semester hours	10	Total semester hours	

Fourth Year

Fall Semester		Spring Semester	
Elective	10	Elective	
Total semester hours	10	Total semester hours	

Professional Responsibility Requirement

† Professional Responsibility and Ethics

Summer Term or Ninth Semester

Elective

REQUIREMENTS FOR THE DEGREE

The student must have completed a residence period of three academic years (four years for evening students) and 84 semester hours of required and elective courses, with a cumulative average of at least 65. At least two academic years of residence and 56 semester hours are required of students admitted with advanced standing. A student must be registered at the National Law Center for the final semester or summer session preceding graduation. Credits allowed for advanced standing are not included in computing the average required for graduation.

Residence

Candidates for the Juris Doctor degree must complete a residence period of three academic years. Attendance in the day division for the fall and spring semesters

* This requirement may be satisfied by service on the *Law Review*, by service on the *Journal of International Law and Economics*, by satisfactory completion of a seminar and other courses that result in a research paper, by participation in upper-class Moot Court, or by satisfactory completion of Law and *Legal Writing*.

† Required prior to graduation for all students entering in the fall 1983 semester and thereafter. May be taken in the second, third, or fourth year.

constitutes residence for an academic year; similar attendance in the evening division constitutes residence for three-fourths of an academic year. Consequently, a day student must attend six semesters to meet residence requirements; an evening student must attend eight. Students authorized to take schedules of less than 10 hours in the day division or less than six hours in the evening division receive residence credit on a proportional basis. Students who attend the summer sessions receive fractional residence credit. These residency requirements apply to students who have entered the National Law Center in 1985–1986 or prior years.

HONORS

The degree of Juris Doctor "With Highest Honors" is awarded to those students, not exceeding three percent of the graduating class, who have obtained the highest cumulative averages of at least 85 or better.

The degree of Juris Doctor "With High Honors" is awarded to those students with the highest cumulative averages of 80 or better. The number of students receiving degrees "With High Honors," when added to the total number of students receiving degrees "With Highest Honors," may not exceed 10 percent of the graduating class.

The degree of Juris Doctor "With Honors" is awarded to those students with the highest cumulative averages of 75 or better. The number of students receiving degrees "With Honors," when added to the total number of students receiving degrees "With High Honors" and "With Highest Honors," may not exceed 40 percent of the graduating class.

ORDER OF THE COIF

The Order of the Coif, a national legal honor society, aims "to foster a spirit of careful study and to mark in a fitting manner those who have attained a high grade of scholarship." The George Washington University Chapter was established in 1926. Members are elected each year from the highest-ranking 10 percent of the graduating Juris Doctor candidates. Only students who have completed their full course of study at the National Law Center are eligible for membership.

PUBLICATIONS

The George Washington *Law Review*, published five times a year, is edited and managed by the students of the National Law Center. The *Law Review* is known for its emphasis on federal and public law; however, it is also devoted to research in other important legal areas. The staff of the *Law Review* is selected on the basis of a writing competition and on the basis of grades. The editorial board is selected from those students who have successfully completed the first year of Law Review work. Students receive 4 semester hours of academic credit for the two-year program.

The George Washington *Journal of International Law and Economics*, managed and edited by law students, is a publication of the Law Center. It presents articles and commentaries on public and private international financial development, comparative law, and international law. The staff of the *Journal* is selected on the basis of grades and a writing competition, and students earn academic credit for their work.

MOOT COURT

The moot court competitions provide realistic training in appellate oral advocacy for students in the National Law Center. The Van Vleck Appellate Moot Court



Board holds an upper-class competition in the fall. There are also moot
competitions in specific areas of the law, including the Jessup International
Moot Court, the Patent Law Moot Court, and the Wagner Labor Law Moot

LAW CENTER ORGANIZATIONS

The Advocate—*The Advocate* is the student newspaper of the National
Center. It features articles by faculty and students on school news and
legal topics.

Asian American Law Student Association—A national organization, the
American Law Student Association serves the needs and concerns of
Americans.

Black American Law Student Association (BALSA)—The Black American
Student Association is a national Black law students organization that
chapters at some 80 law schools. BALSA sponsors law speakers and
programs.

Equal Justice Foundation—The Equal Justice Foundation was founded by Ralph
Nader to encourage action in public interest law among students and practicing
attorneys. The GWU Law School chapter provides summer stipends for
students needing support for low-paying and volunteer legal work, and a similar
permanent plan is envisioned for graduating students. The foundation also
sponsors promotional events, such as speeches, films, and presentations.

International Law Society—The International Law Society is an organization for
students interested in the practice of international law. The Society sponsors
speakers and various programs.

Jewish Law Student Association—The Jewish Law Student Association sponsors
a variety of speaker programs, including a Sunday brunch speaker series.

Law Fraternities and Sororities—The chapters of Beta Kappa Pi, Delta Theta Phi,
Phi Alpha Delta, and Phi Delta Phi at the National Law Center sponsor speakers
and various social occasions.

Law Students Civil Rights Research Council (LSCRRC)—The Law Students Civil Rights Research Council is a national organization of law students concerned with the legal problems of civil rights. LSCRRC offers clinical law projects for which students may receive academic credit.

Movimiento Legal Latino—A national Latino law students organization that has chapters at various law schools, Movimiento Legal Latino sponsors law speakers and various programs.

National Lawyers Guild—The George Washington Chapter of the National Lawyers Guild is designed to bring together those lawyers committed to broad issues of social reform.

Student Bar Association—The Student Bar Association is the law student governing body, responsible for allocating funds among the various student organizations. It also conducts a speaker program for the law school. All members of the student body are members of the Student Bar Association.

Student Intellectual Property Law Association—The Student Intellectual Property Law Association, an organization of students interested in patent, trademark, copyright, and related law, conducts an extensive speakers program as well as various social events.

Women's Rights Committee (WRC)—The Women's Rights Committee is primarily interested in the place of women in law schools and in the legal profession. WRC conducts seminars and sponsors speakers.

JOINT JURIS DOCTOR–MASTER'S DEGREE PROGRAM

In certain instances, arrangements may be made for students to work concurrently toward both the Juris Doctor degree in the National Law Center and a Master's degree in some fields in the University's Graduate School of Arts and Sciences, School of Government and Business Administration, or School of Public and International Affairs. Fields in which this program is available include Business Administration, Economics, International Affairs, Political Science, Public Administration, and Public Affairs. Students must be admitted both to the National Law Center and, separately, to the School that will confer the Master's degree, and must meet all requirements in each degree program. It is possible for a student to complete work for both degree programs within four years.

MASTER'S AND DOCTORAL PROGRAMS

The administration of justice under law is a matter so vast and complex that some who hold the Bachelor of Laws or Juris Doctor degree feel the need for further study. The Master's and doctoral programs give students the opportunity to broaden and deepen their understanding of the law.

The Master of Laws candidate may follow a program of general study or concentrate in one of the specialized areas listed below. Courses in each of these areas are included in the 501–600 series. (Some courses in these areas are included in the 300–400 series.) Graduates who complete their work in one of these areas may have the field of specialization noted on their diplomas.

Administrative Law: Economic Regulation
Corporation Law
Environmental Law
Government Procurement Law
International and Comparative Law
Labor Law
Land Use Management and Control
Law and Criminology
Patent and Trade Regulation Law
Taxation

Programs leading to the degree of Doctor of Juridical Science offer a limited number of unusually talented advanced students, who have already earned the Master of Laws degree, the opportunity to concentrate on research and writing in a specific area of interest to the legal profession.

MASTER OF LAWS

Entrance Requirements

A Bachelor of Laws, Juris Doctor, or equivalent degree from a law school that is a member of the Association of American Law Schools or is approved by the American Bar Association is required. The applicant must have demonstrated a high degree of academic excellence. Advanced standing is not granted for credits earned while a candidate for the first degree in law or for credits earned at other law schools.

Degree Requirements

The student must complete a residence period of not less than two semesters which should be continuous. All requirements for the degree must be completed in this Law Center and in a period not exceeding three years from the time of initial graduate registration, unless an extension is granted in writing by the Dean. The student must complete 24 semester hours of courses and writing projects with acceptable grades. For all courses taken within the Law Center a student must attain the grade of 65 or above. For approved courses taken outside the Law Center, the grade of either *CR* (Credit) or *NC* (No Credit) is assigned. To receive the grade of *CR* in a course taken in other graduate divisions of the University, a student is required to attain the grade of *B* or better. To receive the grade of *CR* in a course taken at Georgetown University through the Consortium of Universities of the Washington Metropolitan Area, Inc., a student is required to attain the grade of *C* or better. A minimum cumulative average of 78 is required at



all times for all LL.M. candidates. The student is expected to include Law 599–600 Thesis in the 24-semester-hour requirement for the degree (for exception, see Master's Thesis, below).

Candidates for the degree in a selected field of specialization must complete a minimum of 12 of the required 24 semester hours in courses and writing projects related to the selected field.

The only credit hours that may be applied to any Post-J.D. degree are those completed while a duly enrolled candidate for that specific degree, with the following exceptions: (1) an unclassified student who has been admitted with the specific right to convert to degree status at the end of a specified number of hours, and (2) S.J.D. candidates who have fulfilled the 8-hour course requirement as unclassified students.

Master's Thesis

Each candidate for the degree of Master of Laws is expected to write a Master's thesis (Law 599–600) under the supervision of a full-time member of the faculty of the National Law Center. Four hours of credit will be granted for successful completion of the thesis. The purpose of this requirement is to demonstrate the ability of the student to perform research in a special area of the law and to produce a scholarly paper containing the results of this research. The thesis is expected to be of substantially the same quality as a law review article. The Dean may waive the thesis requirement upon written request of the student, submitted no later than the beginning of the final semester or summer session before the student's graduation, but only if the student has demonstrated research and writing ability by taking a minimum of 6 semester hours of course work at the National Law Center designated "Research Paper." No thesis waiver will be granted for candidates for the degree of Master of Laws with specializations in international law or government procurement law.

The thesis in its final form must be presented to the adviser no later than the date specified in the Calendar. Two complete copies are required. It is the responsibility of the candidate to obtain from the Post-J.D. Programs Office a printed copy of the regulations governing the styling and reproduction of theses. The mandatory thesis binding fee of $15 must be paid at the time of registration for the last semester's work.

Accepted theses become the property of the University and are placed in the University Library and the Law Library, where the duplicate copies are bound and made available for circulation.

Honors

The degree of Master of Laws "With Highest Honors" is awarded students who obtain a minimum cumulative average of 85.

Graduate Courses in Other Departments

Master of Laws candidates may be permitted to take graduate courses related to their fields of interest in other departments of this University. A maximum of 6 semester hours will be credited toward the degree for such courses; however, credit will be granted only if the courses are given on campus. The grade of *CR* (Credit) or *NC* (No Credit) will be recorded for such courses. Courses numbered 101–200 may be taken for graduate credit only if the student receives the approval of the instructor at the time of registration and does additional work, as prescribed by the department offering the course.

Consortium of Universities of the Washington Metropolitan Area, Inc.

A candidate for the Master of Laws degree may take graduate courses at Georgetown University Law Center through the Consortium of Universities of the

Washington Metropolitan Area, Inc. A maximum of 6 semester hours of such courses may be credited toward the degree. Permission to take Consortium courses must be granted by the Dean, the Registrar, and the instructor offering the course. The grade of *CR* (Credit) or *NC* (No Credit) will be recorded for such courses. To receive the grade of *CR* a student must attain a grade of *C* or higher.

DOCTOR OF JURIDICAL SCIENCE

Entrance Requirements

Admission to candidacy for the degree of Doctor of Juridical Science requires a Bachelor of Arts or equivalent degree from an approved college or university, a Bachelor of Laws, Juris Doctor, or equivalent degree, earned with high rank from a law school that is a member of the Association of American Law Schools or approved by the American Bar Association; a Master of Laws degree with high academic standing; outstanding capacity for scholarly work in the field of law and faculty approval of the applicant's dissertation topic. Applicants must also demonstrate their writing ability by submitting the Master's thesis or a copy of one or more papers or articles that the applicant has written. Following consultation with the Dean, the applicant must obtain a faculty adviser, to be designated committee chairman, from the regular, full-time faculty; reach agreement on the acceptability of the proposed topic for the dissertation; and submit a detailed outline for the adviser's approval, indicating by chapter and division within chapter the exact scope of the project. There should be a bibliography for each chapter, listing books, reports, cases, and law review articles to be considered. Although the outline cannot predict every detail of the subsequent research, it must be sufficiently definite to afford the Graduate Board a basis for evaluation.

Once the outline is approved, the applicant's committee is expanded to three members; this consultative committee must recommend the acceptance of the applicant to the full Graduate Board. The Board then acts upon the recommendation and may either accept or reject the applicant as an S.J.D. candidate. In no instance will any applicant be admitted to degree candidacy prior to the above procedures; however, the applicant may be registered as an unclassified student for purposes of course work requirements (see below). Approval for degree candidacy must be received within one year of the appointment of an adviser unless a written extension is granted by the Dean.

Degree Requirements

The candidate must complete (1) a residence period of not less than one academic year; (2) a course of study and research—designated by the consultative committee and approved by the Graduate Board—of no less than 8 semester hours including Jurisprudence, unless previously taken; and (3) an acceptable dissertation. The dissertation must be submitted no later than three years from the date of admission to candidacy for the S.J.D. degree. The applicant who proposes to write on a comparative law topic must have a reading knowledge of the language in which the relevant materials are to be found. When the dissertation is submitted, the consultative committee will set the date for an oral examination. This examination is conducted by the consultative committee and such other members of the faculty and qualified experts as are selected by the Graduate Board.

No later than the date specified in the Calendar, the candidate must submit to the Dean two complete copies of the dissertation and two copies of an abstract (not to exceed 600 words) of the dissertation.

Printed copies of detailed regulations regarding the form and reproduction of the dissertation and preparation of the abstract are available in the Office of the

Dean. To be acceptable the dissertation must, in the opinion of the examining committee, constitute a substantial contribution to the field of law concerned and be suitable for publication. Additional information will be supplied by the Dean. Accepted dissertations become the property of the University and are placed in the University's Gelman Library and the Law Library, where the duplicate copies are bound and made available for circulation.



DEGREE PROGRAMS FOR INTERNATIONAL STUDENTS

The National Law Center has several programs of study available to stud... trained in law outside the United States. These programs fall into two gen... categories: those directed toward preparing students for a bar examination in a... American jurisdiction and those that enable students to return to their countri... with a more thorough understanding of some aspects of American law.

A student with a degree from a foreign law school who has met the extremely competitive admissions criteria will be admitted to the Law Center as a candidate for the Master of Comparative Law (Foreign Practice) (M.Comp.L.) or Master of Comparative Law (American Practice) (M.Comp.L. [Am.Prac.]) degree.

To prepare for admission to the bar of an American jurisdiction, the student may apply for either the Juris Doctor or the Master of Comparative Law (American Practice) degree. The J.D. degree requires 84 semester hours of work at law school (credit is given for work in a foreign law school only in exceptional circumstances) and will qualify the student to take most U.S. bar examinations. The M.Comp.L.(Am.Prac.) degree requires 32 semester hours of work and satisfies the requirements of the District of Columbia Bar. *Students are cautioned to ascertain the requirements of the bar for which they intend to qualify prior to selection of their law school programs.*

Foreign students planning to return to their home countries may undertake a program leading to the degree of Master of Comparative Law (Foreign Practice). This degree program enables the student to gain a broad comprehension of the American legal system by taking basic courses in the Law Center. However, it is not intended to qualify a student to take a U.S. bar examination. Courses taken by unclassified students will not be certified for bar admission purposes unless specific arrangements have been made prior to a student's registration in unclassified status.

ADMISSION PROCEDURE

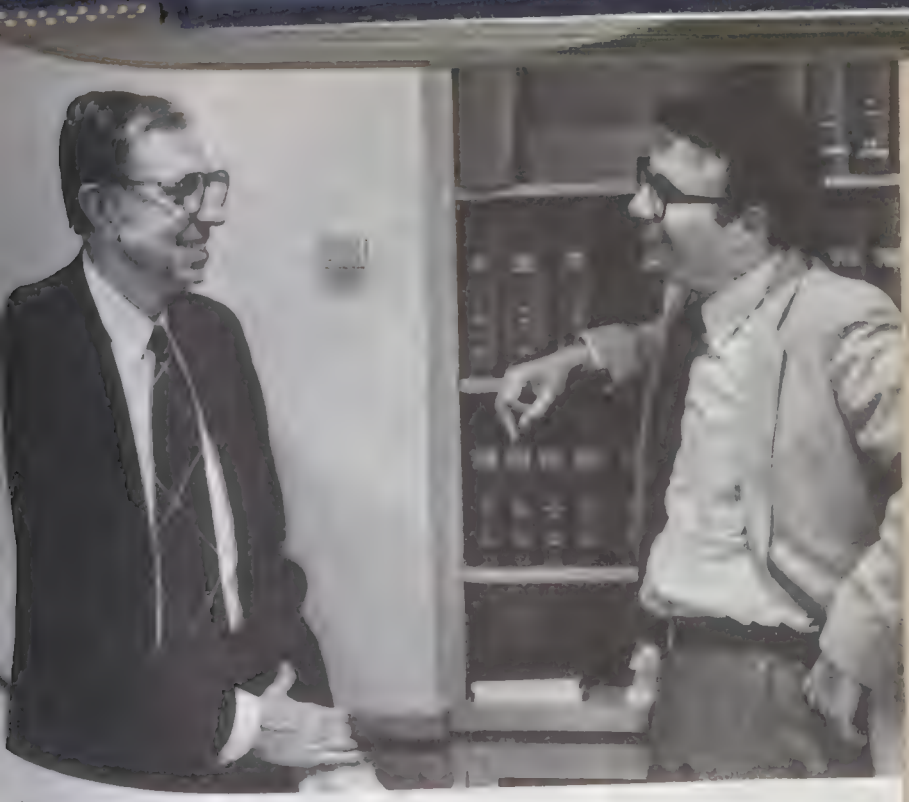
Application must be received from *foreign applicants* no later than June 1 for the fall semester (March 1 for candidates for the Juris Doctor degree), October 1 for the spring semester, and March 1 for the summer sessions.

Required Records

Applicants must request all educational institutions attended to send directly to the Dean official credentials listing subjects studied, grades received, examinations taken, and degrees received. Original diplomas, certificates, and transcripts from secondary schools and all colleges and universities attended are required but in exceptional cases certified copies will be accepted. Records of state examinations and certificates are also needed. All records become the property of the University and *cannot* be returned.

Language Test

Students whose native tongue is not English are required to take the *Test of English as a Foreign Language* and attain as an absolute minimum the score of 550 to be considered for admission to the National Law Center. This is a mandatory requirement. Students are responsible for making arrangements for taking the test and should address inquiries to TOEFL, Educational Testing Service, Princeton, New Jersey 08541, U.S.A. The completed application form should be returned to the Testing Service at Princeton well in advance of the beginning of the semester for which the applicant seeks admission. The test fee, which should be remitted with the application, entitles the student to have the test score sent to three different institutions. Registration for the *Test of English as a Foreign*



Language does *not* constitute application for admission to George Washington University.

The Bulletin of Information, obtainable without charge, contains a description of the test as well as rules regarding application, fees, reports, and the conduct of the test; lists of examination centers; examination dates; and an application blank. On the application for the test, the student should specify that the scores be sent to the Dean's Office.

ENTRANCE REQUIREMENTS

For the Degree of Juris Doctor—Entrance requirements for foreign students are the same as those stated on pages 11–12, except that advanced standing is rarely granted for study in foreign law schools.

For the Degrees of Master of Comparative Law (Foreign Practice) and Master of Comparative Law (American Practice)—The entrance requirements are the successful completion of and graduation from a course in arts, philosophy, letters, or sciences, equivalent to graduation from a gymnasium, lycée, or liceo; and graduation in law with high academic standing from a recognized foreign university. Admission to the American Practice program is limited to the fall semester each year.

For the Degree of Master of Laws—A foreign student will only be considered for admission to the Master of Laws program if he or she has a Juris Doctor or post-Juris Doctor degree with high academic standing from an American university.

For the Degree of Doctor of Juridical Science—The usual entrance requirements are the successful completion of and graduation from a course in arts, philosophy, letters, or sciences, equivalent to graduation from a gymnasium, lycée, or liceo; graduation in law from a recognized foreign university; outstanding capacity for scholarly work in the field of law; and a Master of Laws degree with high academic standing from an American university.

DEGREE REQUIREMENTS

Juris Doctor, Master of Laws, Masters of Comparative Law, and *Doctor of Juridical Science*—Degree requirements for foreign students are the same as those stated on pages 14, 18, and 20.

Master of Comparative Law (Foreign Practice)—The student must complete a residence period of at least two continuous semesters. All requirements for the degree must be completed in a period not exceeding three years from the time of registration for the degree. The student must complete satisfactorily 24 semester hours of approved courses in the Law Center, or in such other departments of the University as the faculty of the Center shall approve, and must maintain a cumulative average of at least 65 at all times.

Master of Comparative Law (American Practice)—The general requirements are the same as those for the degree of Master of Comparative Law (Foreign Practice) except that this degree requires 32 semester hours of course work. However, the courses approved will be limited to the required courses in the Juris Doctor curriculum (see pages 13–14) for those with a civil law background. For those with a common law background, a careful selection of required as well as core elective courses in the Juris Doctor program will be approved. A cumulative average of at least 65 must be maintained at all times.

UNCLASSIFIED STUDENTS

Two types of students may be admitted to the National Law Center as unclassified students, in accordance with the following regulations:

1. A candidate for a Bachelor of Laws or Juris Doctor degree with an above average record at another law school that is a member of the Association of American Law Schools or is approved by the American Bar Association may, at the discretion of the Dean, be admitted as an unclassified student to earn credit for transfer to the other law school. Such students are normally admitted only to the summer sessions. They are admitted to the fall or spring semester only in unusual circumstances.

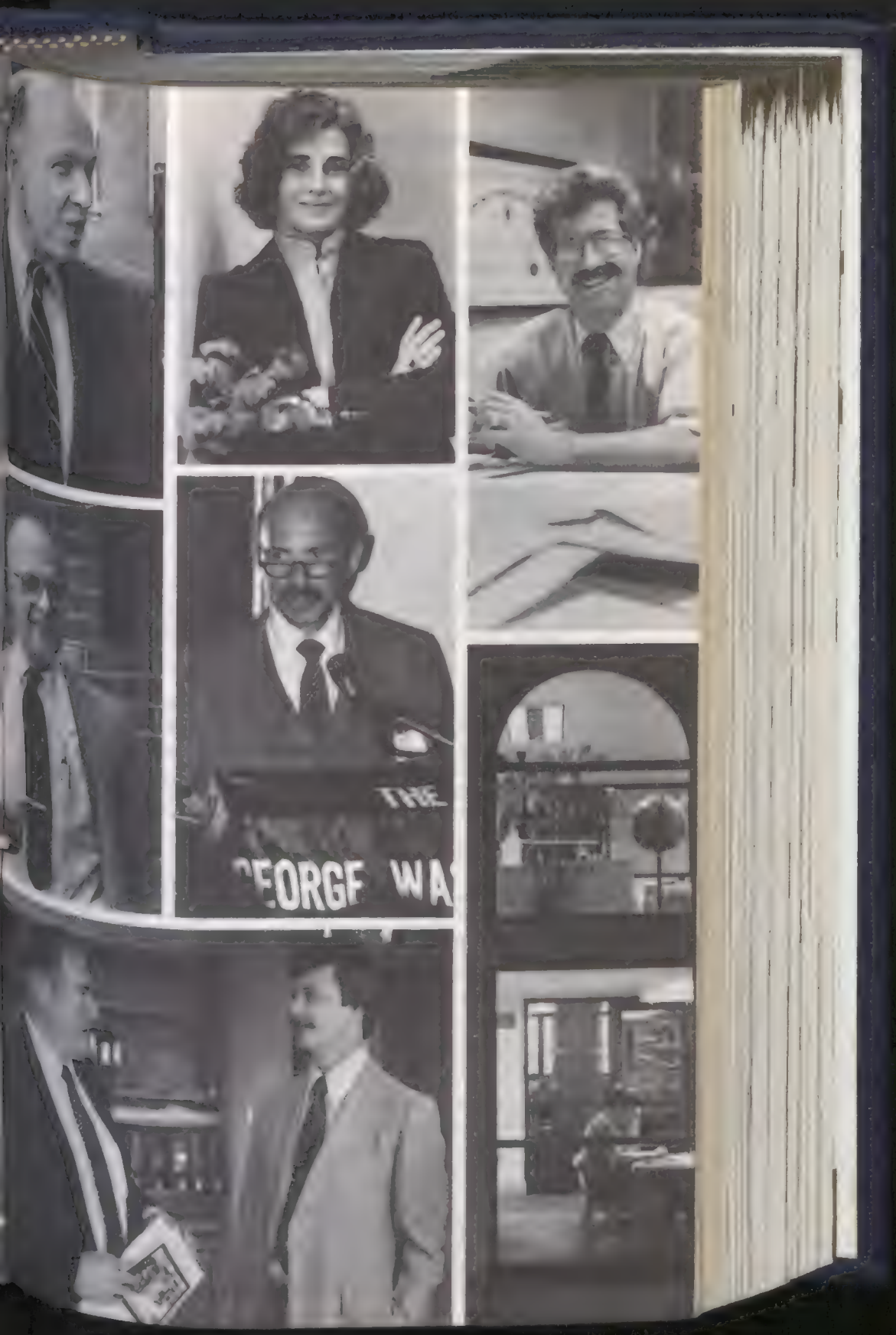
2. Graduates of law schools that are members of the Association of American Law Schools or are approved by the American Bar Association who wish to take advanced courses without pursuing degree programs may be admitted as unclassified students.

Unclassified students participate in the work of the course, take examinations, and have their grades recorded. Credit for work earned as an unclassified student may not be applied to satisfy the requirements for a degree program unless express written approval is granted by the Dean at the time of admission.

CONTINUING LEGAL EDUCATION

Members of the Bar who wish to keep abreast of current developments in the law may register for any of the courses in the National Law Center on a non-credit basis as Continuing Legal Education students. Such students do not take examinations in courses and no grades are recorded for their work.

A simplified admission and registration procedure is used and must be completed on or before the last day of regular registration for the appropriate semester. Continuing Legal Education students pay only the tuition fee on the semester-hour basis. They may not participate in student activities or benefit from the medical privileges of the University. (Continuing Legal Education registrations are subject to cancellation if courses are filled by regularly registered students.)


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GENERAL INFORMATION

The National Law Center has an enrollment of about 1,700 for the J.D. and
J.D. degree programs. Approximately 1,000 students are enrolled in the full-
day division for the J.D. degree and 400 are enrolled in the part-time eve
division. Three hundred students, many from abroad, are enrolled in the Post
degree programs.

DAY AND EVENING CLASSES

Day classes meet in the mornings in 50-minute periods and in the afterno
50-minute periods and also in sessions of two 50-minute periods Mon
through Friday. *Trial Practice Court* and certain other courses meet for two-h
periods on Saturday mornings.

Evening classes meet from 5:50 to 7:40 p.m., Monday through Friday. A fo
credit course, e.g., Evidence, meets two evenings a week; a three-credit cour
e.g., Administrative Law, meets two evenings a week for one-half the semester a
one evening for the other half; a two-credit course, e.g., Contracts II, meets
evening a week. The evening division conforms to the standards of the d
division, with the full-time faculty participating in the instruction.

Examinations for both day and evening classes may be given in the afterno
only. Examinations for day students may be given in the evening.

SUMMER TERM

A term of two sessions, with day and evening classes, is offered in the summ
Students may register for either or both sessions. *No beginning students a*
admitted to the Juris Doctor program in the summer term.

The summer term is shorter than a semester of the academic year, and a
consequence, a student must attend two and one-half summer terms to rece
residence credit for one academic year or attend one and one-half summer ter
to receive residence credit for a semester.

A maximum of 6 semester hours may be taken each summer session by d
students. Day students receive four-tenths of a semester of residence credit f
each session of the summer term in which they are registered for 3 or mo
semester hours. A maximum of 4 semester hours may be taken each session b
evening students. Evening students receive three-tenths of a semester of res
dence credit for each session of the summer term in which they are registered f
2 or more semester hours.

ADMISSION

Applicants are urged to submit application forms and complete credentials no
in advance of the semester for which they seek admission. In the selectio
process, there is no discrimination against any applicant because of sex, age
color, religion, handicap, or national origin. An application fee of $30 for a degre
candidate ($15 for an unclassified student) must accompany the application

Forms for application for admission or readmission are available at all
should be returned to the Office of Admissions of the National Law Cente
George Washington University, Washington, D.C. 20052.

For further details concerning students from foreign institutions, see pages 22–24.

APPLICATION FOR ADMISSION

Juris Doctor Program—Beginning students are admitted only at the start of the fall semester.

The applicant should register with the Law School Data Assembly Service (LSDAS), by completing and mailing the registration forms supplied by the Law School Admission Services (LSAS). No application to this school will be processed unless accompanied by a Law School Application Matching Form, which is found in each applicant's LSAT/LSDAS registration packet. Since an LSAT and/or LSDAS report cannot be produced by LSAS without the Matching Form, it will be necessary to return to the applicant any application received without it. A transcript from each college or university attended should then be sent directly to LSAS, Box 2000, Newtown, Pennsylvania 18940. No transcript should be sent to the National Law Center. The LSDAS will analyze the transcript and send a copy to this law school and others designated on the registration form. However, the applicant will be asked, upon acceptance, to submit directly to the National Law Center a final transcript showing evidence of the receipt of a Bachelor's degree.

To provide time for the evaluation of credentials of beginning students, all papers, including the Law School Admission Test score, should be received by the National Law Center before March 1. This means that the October or December Law School Admission Test should be taken (see Entrance Requirements, pages 11–12).

All applications of transfer students should be received by the Admissions Office no later than June 1 for the fall semester, December 1 for the spring semester, May 1 for the first summer session, and June 1 for the second summer session.

For additional information, see the official *Pre-Law Handbook* prepared by the Law School Admission Council and the Association of American Law Schools. The Handbook includes material on the law and lawyers, pre-law preparation, applying to law schools, and the study of law, together with individualized information on most American law schools. It may be obtained at college bookstores or ordered from Law School Admission Services, Box 2000, Newtown, Pennsylvania 18940.

Master's Programs—Students are admitted at the beginning of the fall or spring semester or any of the summer sessions. Application for admission, together with all required credentials, must be received by July 1 for the fall semester, November 1 for the spring semester, and one month prior to registration for the summer session for which application is made.

Doctoral Program—Students are admitted at the beginning of the fall or spring semester. Application for admission, together with proposed dissertation topic and all required credentials, must be received by March 1 for the fall semester and October 1 for the spring semester.

Unclassified Students—Lawyers who wish to take graduate courses are admitted at the beginning of the fall semester, the spring semester, or any of the summer sessions. Students who wish to earn credit for transfer toward a Bachelor of Laws or Juris Doctor degree at another institution may be admitted to the summer sessions if they are in good standing at an accredited law school and have shown unusual ability in their law studies; they are admitted to the fall or spring semester only in unusual circumstances.

1. Application for admission, with required credentials, for a student who wishes to earn credit for transfer toward a Bachelor of Laws or Juris Doctor

degree at another law school (see page 24), should be received at the Of
Admissions of the National Law Center at least one month prior to the first
registration for the semester or summer session for which application is
2. Application for admission, with required credentials, for lawyers who
to take graduate courses (see page 24), should be received at the Offi
Admissions of the National Law Center by July 1 for the fall semester, Novem
for the spring semester, and one month prior to registration for the sum
session for which application is made.

READMISSION

A student who was previously registered but did not attend during the
recent semester (summer term excluded) should file an application for readm
sion. Closing dates for readmission are the same as those for admission
Application for Admission, above).

If the student has attended one or more institutions of higher educa
during absence from the University or applies as a degree candidate and w
previously a nondegree student, he or she must have complete, official tr
scripts sent to the Dean.

REGISTRATION

Before attending classes each student must register in person. No student will
registered until proper credentials have been filed and approved (see Admissio

No registration is accepted for less than a semester or one summer sessio

A student may not register concurrently in George Washington University an
another institution. Registration in more than one college, school, or divisio
the University requires the written permission of the deans concerned *prior*
registration.

ELIGIBILITY FOR REGISTRATION

A student who is suspended or whose record is not clear for any reason is no
eligible to register.

New Student—Upon receipt of a *final letter* of admission a new student
eligible for registration on the stated days of registration.

Readmitted Student—A student previously registered who was not registered
for courses during the preceding semester or summer session must apply for adm
receive a letter of readmission (see Readmission, above) before becoming eligible
for registration.

DATES AND PLACE OF REGISTRATION

Registration is held in Stockton Hall, 720 Twentieth Street, N.W., during the
following periods: fall semester, August 22 and 23; spring semester, January 6 and
7. For late-registration fees, see Special Fees, below. Registration may be changed
only with the permission of the Dean.

FEES AND FINANCIAL REGULATIONS

The following fees and financial regulations were adopted for the 1985 summer
sessions and the 1985–86 academic year.

Tuition Fees

J.D. candidates:

Full-time program (11 or more hours*), each semester:

Students who entered the program in fall 1983 and thereafter .. $4,880.00

Students who entered the program before fall 1983 ..... 4,340.00

Part-time program, each semester hour:

Students who entered the program in fall 1983 and thereafter .. 349.00

Students who entered the program before fall 1983 ..... 310.00

Master's degree candidates (LL.M., M.Comp.L., and M.Comp.L. [Am. Prac.]) and Continuing Legal Education students, each semester hour..... 260.00

S.J.D. candidates,† full program, including the final examination 8,800.00

University Center Fee (charged all students registered on campus)

Each semester hour, to a maximum of $82.50 per semester..... 7.75

Computer Usage Fees (charged for courses that use the computer facilities of the University)—Applicable fees are listed in the *Schedule of Classes* for each semester. The fee is $50 per course, but no student will be charged more than $100 per semester for computer use.

Special Fees

Application fee (degree candidate), nonrefundable 30.00

Application fee (unclassified student), nonrefundable 15.00

Tuition deposit fee charged each student admitted to J.D. degree candidacy (payable in two installments—$100, nonrefundable, by a date specified in the letter of admission; $350, nonrefundable, by June 1)..... 450.00

Fee for binding Master's theses and S.J.D. dissertations 15.00

Late-registration fee, for failure to register within the designated period:

During first week of classes 25.00

During second and third weeks of classes 50.00

After third week of classes (if permitted)..... 100.00

Late-payment fee, charged for failure to make payments when due (see Payment of Fees, below) 15.00

Replacement of lost or stolen picture identification card 2.00

Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, below) 35.00

Returned check fee, charged a student whose check is returned because of insufficient funds or for any other reason..... 15.00

Transcript fee 2.00

If two or more transcripts are requested at the same time, fee for each of the first two copies is $2; fee for each additional copy .... .50

Registration on campus in the University entitles each student to the following privileges: the services of the Career Services Center; the use of the University Library; gymnasium privileges; admission to all athletic contests, unless otherwise specified; subscription to the *Hatchet*, the student newspaper; admission to University debates; and medical attention as described under Student Health

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* With the prior permission of the Dean, a J.D. degree candidate may take more than 14 semester hours after the first year of study.

† The tuition fee is to be paid at the rate of $2,200 per semester for four successive semesters, exclusive of the summer term or terms. If the Faculty should approve an extension of time, the student must maintain enrollment.

Service. These privileges terminate and a student is no longer in residence upon withdrawal or dismissal from the University.

PAYMENT OF FEES

No student is permitted to complete registration or attend classes until all charges are paid or until arrangements for payment have been made. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks and postal money orders should be made out to George Washington University with student identification number shown in the upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. Students registered for 6 semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration, permitting them to pay one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the ninth week of classes for the fall and spring semesters. Interest at the rate of 1 percent per annum on the unpaid balance will be charged from the date of registration to the date payment is made. A 10-month payment plan is also available.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $1,500 or more. Under such circumstances the student may be permitted to pay one-half of the amount due from the student at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to the interest charge of 8 percent per annum. Accounts that become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due the University in addition to a financial reinstatement fee of $35.

Returned Check Policy—A student whose check is returned unpaid by the bank for any reason will be charged a returned check fee. If the check is not paid within 15 days, the student's account will be financially encumbered, with the same restrictions and penalties as for late payment enumerated above.

PREPAID AND DEFERRED PAYMENT PLANS

Several commerical programs for those who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106

Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100

The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs, but will be happy to provide guidance to students and parents.

WITHDRAWALS AND REFUNDS*

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the Dean. Withdrawal from courses is permitted after the midpoint of a semester only in extraordinary circumstances. Notification to an instructor is not an acceptable notice.

Unauthorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. *Complete withdrawal* from the University:
   Withdrawal on or before Friday of the first week of classes 90%
   Withdrawal on or before Friday of the third week of classes 75%
   Withdrawal on or before Friday of the fifth week of classes 50%
   Withdrawal after the fifth week of classes . . . . . None
2. *Partial withdrawal:* If the change in program results in a lower charge, the refund schedule above applies to the difference.
3. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be refunded or reduced because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

FINANCIAL AID

The National Law Center has been able in recent years to assist many students in obtaining the financial aid they require, through full or partial scholarships, various loan programs, part-time employment, or a combination of these kinds of assistance.

GRADUATE AND PROFESSIONAL SCHOOL FINANCIAL AID SERVICE

The National Law Center participates in the Graduate and Professional School Financial Aid Service (GAPSFAS), which provides an analysis of an applicant's financial needs. Entering students wishing to receive financial aid should request the materials from GAPSFAS, Educational Testing Service, Box 2614, Princeton, New Jersey 08541. The information provided by the applicant and the applicant's parents will be analyzed and a copy of the report will be sent to the Law Center. In addition, students entering the National Law Center in the day program who

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*The $450 deposit required of entering students is nonrefundable. Regulations covering withdrawal and refunds for the summer sessions are stated in the *Summer Sessions Schedule of Classes*.

desire to be considered for a scholarship must submit a letter to the Law Cen by March 1 outlining their academic qualifications, their extracurricular activ and their reasons for believing a scholarship award to them is justified.

Students needing financial assistance should file with GAPSFAS in time their reports to be received at the Law Center as early as possible, since t Committee on Student Financial Aid of the Law Center will begin making awar in March, and available funds are limited.

No awards will be made to an entering student until the admission process has been completed.

JURIS DOCTOR PROGRAM

Scholarships, Fellowships, and Research Assistantships

Application and correspondence concerning scholarships, fellowships, and research assistantships should be sent directly to the Dean. Unless otherwise specified, application and supporting credentials should be submitted no later than March 1 preceding the period for which the award is made.

Arent, Fox, Kintner, Plotkin & Kahn Scholarship (1973)—Scholarship aid for needy law students from the Washington, D.C., area.

Mildred Gott Bryan Scholarship Fund (1965)—Partial scholarship aid for students in the National Law Center.

Jacob Burns Fellowship Fund (1983)—Income from the Fund is to be used annually to award substantial grants to incoming students without regard to financial need in order to attract the highest achievers and those with the greatest intellectual promise to this law school. All students who receive such awards are to be known as Jacob Burns Fellows of the National Law Center at The George Washington University. Five $5,000 awards will be made for 1985–1986.

Charles Worthington Dorsey Memorial Scholarship (1974)—Memorial to Charles Worthington Dorsey, LL.B. 1881, LL.M. 1882. A full-tuition scholarship for the course leading to the degree of Juris Doctor, awarded to a needy and promising graduate of this University with a Bachelor of Arts or equivalent degree. Ordinarily this scholarship is awarded once every three years.

Honor Scholarships—Two scholarships available each year to students entering upon full-time study. Each scholarship provides a cash award, in addition to tuition aid, in an amount depending on need, for all three years. These scholarships are awarded on the basis of outstanding college records both academic and extracurricular; Law School Admission Test scores; and need. To retain the scholarship for the second and third years, the candidates must maintain a *B* average, both for each year and cumulative.

Howrey and Simon Scholarship (1982)—An annual award to provide tuition assistance to worthy students.

Hunton and Williams Scholarship (1981)—An annual award of $1,000 given by the law firm of Hunton and Williams in recognition of the quality of the legal education offered at this law school.

Law Center Tuition Remission—For Juris Doctor students, based on financial need.

Phi Delta Delta Scholarships (1959)—Zeta Chapter of Phi Delta Delta Legal Fraternity (International) provides tuition aid to a student in the second year of the Juris Doctor program who excelled in scholastic achievement and service to the Law Center in the first year.

Vernon Romney Scholarship Fund (1977)—To provide a scholarship to some worthy student in the Law Center.

Trustee Scholarships—Scholarships awarded each year to entering full-time students, for tuition aid, in amounts depending on need. Candidates must have demonstrated qualities of leadership, in addition to scholastic attainment to

retain the scholarship, the successful candidate must maintain a *B* average, both for each year and cumulative. Application must be made to the Dean before March 1.

Tuition-aid scholarships are also available to continuing second- and third-year full-time students with demonstrated scholastic ability, on the basis of financial need and capacity for leadership. Application should be made to the Dean prior to June 1.

Frank S. Whitcomb Scholarship Fund (1971)—Bequest of Frank S. Whitcomb for the purpose of aiding and assisting worthy young men and women in securing a legal education.

Graduate Fellowship Information Center—Students may also wish to visit the Graduate Fellowship Information Center (Gelman Library, 2130 H St., N.W.) for additional information on fellowships and grants.

Loan Funds



Through the generosity of friends of the University, a number of loan funds are available. Among them are the Lyle T. Alverson Loan Fund; the Robert Ash Loan Fund; the George R. Beneman Loan Fund; the Morris and Gwendolyn Cafritz Foundation Minority Law Student Loan Fund; the Robert M. and Mary McConnel Cooper Loan Fund; the Robert McKinney Cooper Memorial Loan Fund; the J. Forrester Davison Loan Fund; the Clifford A. Dougher-ty Fund; the District of Columbia Bar Association Loan Fund; the J.W. Fulbright Foundation Loan Fund; the Newell W. Ellison Loan Fund; the Harold L. and Violet George Foun-dation Loan Fund; the George Washington Law Association Loan Fund; the Morris Golub Loan Fund; the Jephson Educational Trust Loan Fund; the Law Association Loan Fund for the law classes of 1912, 1918, 1921, 1923, 1929, 1931, 1933, 1935, 1936, 1937, 1938, 1939, 1941, 1942, 1945, 1950, 1951, 1952, 1953, 1955, 1959, 1960, 1961, 1962, 1963, 1964, 1965; the Law School Loan Fund; the Oscar Lawler Memorial Loan Fund; the Horace L. Lohnes Memorial Assistance Fund; the Jessie B. Martin Loan Fund; the Robert N. Miller Loan Fund; the Joan Murphy Loan Fund; the Mike Pelekiri Loan Fund; the Phi Delta Delta Fund; the W. Theodore Pierson Loan Fund; the Rockport Loan Fund; the Samuel L. Samuel Loan Fund; the H. William Tanaka Law Students Assistance Loan Fund; the Orville Hassler Walburn Memorial Loan Fund; the W.H. Williams Memorial Student Loan Fund; the Ruth F. Wilson Loan Fund; the Yadao and Watanemoto Loan Fund; and the Samuel Green Memorial Loan Fund.

In addition, financial assistance is available through the Guaranteed Student Loan Program, National Direct Student Loans, work-study, and other sources. Application for financial assistance should be made in the Office of the Dean.

MASTER'S AND DOCTORAL PROGRAMS

Fellowships and Scholarships

Application should be made before March 1 preceding the period for whic
award is made. The applicant should submit an application for admissio
degree candidate and a personal letter applying for a fellowship to the Dea
letter of application should contain complete biographical data, informa
concerning experience in practice or teaching, copies of or citations to publ
legal writings, and such other information the student believes will
assistance in the consideration of the application. Applicants should arrang
letters of recommendation to be sent from two members of their law fa
directly to the Dean. The applicant's academic rank in class should be inclu
either in the transcript of the law school or in the letters of recommendatio

Marcus B. Finnegan Memorial Fellowship—Established in memory of Mar
B. Finnegan, LL.M. '57, who, as an alumnus, lawyer, and teacher brou
distinction to the field of patent law. The Fellowship was established in 1997
generous gifts by Mr. Finnegan's law firm, Finnegan, Henderson, Farabow, Ga
& Dunner, his clients, and his many friends. The income from the Fellowship
used to finance a Graduate Fellowship in Intellectual Property with a requ
ment that the recipient of the Fellowship prepare a publishable paper in the fi
of international intellectual property.

Richard Paul Momsen Scholarships for Brazilian Graduate Law Students
Bequest of Richard Paul Momsen, LL.B. 1912. Awarded 1984–85 and alternat
years, for the study of U.S. constitutional law and the law of patents a
trademarks.

Teaching Fellowships—Three or four fellowships available each year wit
stipend of $8,000 plus tuition for an approved course of study leading to
advanced degree. Teaching fellowships are awarded for a term of two academ
years. The stipend for the second year is $9,000 plus tuition. Fellows conduct
first-year course in Legal Research and Writing and work with the students
improve their legal writing ability. By arrangement with the Dean, they may al
be given the opportunity to teach additional courses.



PRIZES

Bureau of National Affairs Law Student Award—Presented to an outstanding senior law student

Jacob Burns Prize—Established by Jacob Burns, a law alumnus and Honorary Trustee of the University. A medal and a cash award presented annually to each of the two members of the winning team in the upper-class Van Vleck Moot Court competition.

The Michael D. Cooley Memorial Prize—A plaque given to that individual in each graduating class who has been most successful in maintaining his or her compassion vitality, and humanity during law school. The recipient of this award is selected by the graduating class during the spring of the third year at the National Law Center.

Ogden W. Fields Graduate Prize—Awarded annually to the graduate student who has demonstrated the highest overall proficiency in a course in labor law.

Charles Glover Prize—Established by Charles Carroll Glover, Jr., an Honorary Trustee of the University, in memory of his great-grandfather, an illustrious member of the bar of the District of Columbia. A cash award given annually to the student who has attained the highest average grade in the third-year, full-time course.

Kappa Beta Pi Prize—Awarded by Eta Alumnae Chapter to the law student who attains the highest average for the first year.

John Bell Larner Prize—By bequest, a medal awarded annually to the member of the graduating class who attains the highest average grade in the entire course of the degree of Juris Doctor.

John Ordronaux Prizes—By bequest, awarded annually to the student who has attained the highest average grade in the first-year, full-time course and to the student who has attained the highest cumulative average grade at the end of the second-year, full-time course.

Jennie Hassler Walburn Prize—A cash award to the outstanding student in the field of civil procedure, established by the will of the late Professor Orville Hassler Walburn in memory of his mother.

REGULATIONS

ACADEMIC WORK LOAD

Juris Doctor Candidates—Juris Doctor candidates without substantial outside employment may take a program of studies of 14 hours a week. Such students may take courses in the evening only if they are not scheduled in the daytime and a majority of the hours taken are in day courses. The Dean is authorized to approve programs of study of more than 14 hours in exceptional cases; however, no program will be approved that would permit the student to complete requirements for the degree in less than 28 months after beginning the first year of law study. Students with more than 20 hours of outside employment, whether in the day or evening division, must take a limited program of studies not exceeding 10 hours a week. Students taking a majority of their classes in the evening may not take more than 10 hours a week; the minimum load is 8 hours, except in special cases when 6 hours may be approved by the Dean for a limited program. A minimum schedule for 11 hours in the day division is required except in exceptional circumstances when a reduced program is authorized by the Dean. Students taking more than 8 hours in the day division or 4 hours in the evening division must have the permission of the Dean to take a Bar Review

Students may transfer from the day division to the evening division only w the permission of the Dean.

With the approval of the Dean, second- and third-year students may ta maximum of 6 semester hours of appropriate graduate-level courses in o departments of the University; such a student must receive a grade of at least obtain credit for such courses, and in no event will the grade count in comput the cumulative average.

Master's Candidates—Master's candidates without substantial outside e ployment may take a maximum of 12 hours a week. Students with more than hours of outside employment must take a limited program of study not to exce 8 hours a week. The minimum load is 4 hours unless approval for fewer hours given by the Dean for a limited time.

ATTENDANCE

Regular attendance at classes is required and is necessary for successful work student who is deficient in class attendance in any course may be barred from taking the examination.

CHANGES IN PROGRAM OF STUDIES

A student may not add courses or change from one section to another of th same course without the approval of the Dean. Students may drop courses on with the written approval of the Dean. In addition, approval of the instructor ordinarily required unless the request is made early in the semester. Under circumstances may a student drop a course after the last day of classes in a semester or summer session.

RESEARCH PAPERS

The preparation of a research paper is required in lieu of an examination seminars and in other courses, as indicated in the course descriptions. To receive a numerical grade on a research paper, the paper must be submitted by the last day of classes in the semester or, with the permission of the instructor, by the day of the examination period (the last day of any examination given in a course). For sufficient reason, the instructor may extend the deadline (but no later than the last day of the examination period of the following semester without express permission of the Dean, not later than the normal graduation date for the student), subject to the following conditions: (1) no student will receive any credit for the course for any purpose until a paper acceptable to the instructor has been submitted; (2) the only grade the student may receive for the course is *CR* (Credit) or *NC* (No Credit). To receive credit, a minimum grade of is required for J.D. candidates and 75 for LL.M. candidates. Failure ultimately to submit any paper for the course will result in a grade of 45. Students who are candidates for the J.D. degree may register for one course requiring a research paper in each semester; with the approval of the Dean such students may register for more than one such course each semester.

The following guidelines have been approved by the faculty and are intended to apply to Law 314, *Legal Writing*, and to research paper courses that satisfy the legal writing requirement. The faculty recommends that the paper's topic and length should receive specific approval by the faculty member. Furthermore, an outline should be submitted, to be followed by a draft. (The purpose of a draft submitted during the course of the semester, is to allow the student the opportunity to improve the paper. A faculty member has the discretion to require a revised draft or to permit one if so requested by the student. A revised draft is necessary only if the professor requires it.) Approval of the topic, outline, and draft should be by a specified date. The paper should follow the Blue Book style

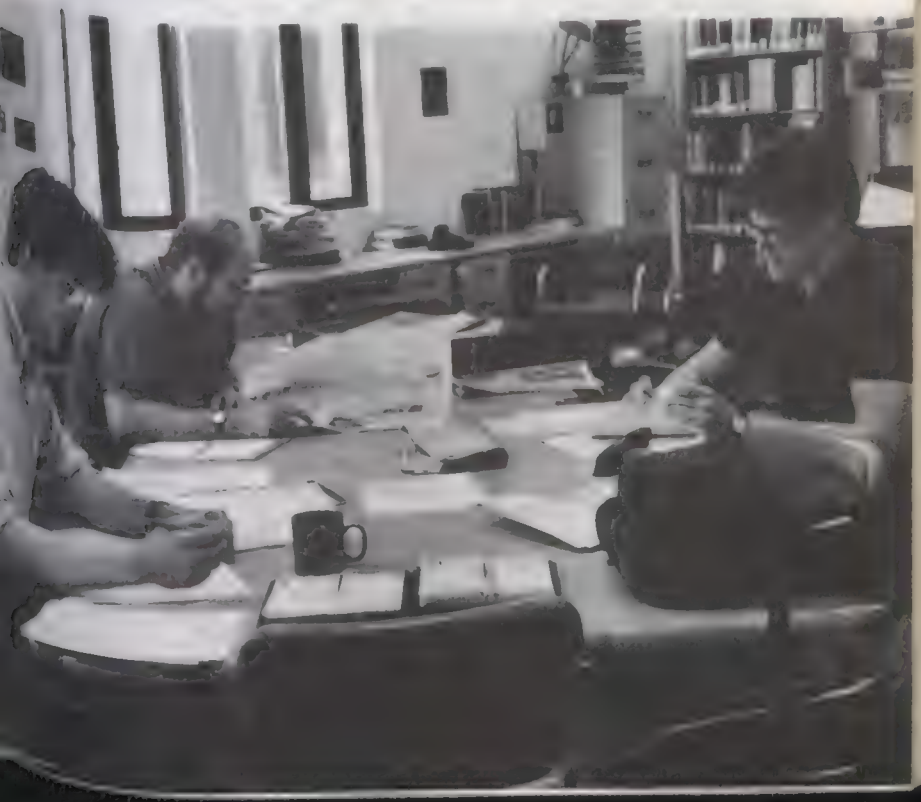
EXAMINATIONS

Written examinations are held at the end of most courses. Every student is required to take the regular examinations unless excused. No excuse for absence will be granted except by the Dean and then only for illness or other emergency. Application for excuse must be made in writing not later than one month after the date of the examination. A student excused from a final examination will be permitted to apply to the instructor for a Credit/No Credit determination. The instructor will select the mode of determination (for example, a make-up examination or paper). The student will have the option of (1) complying (prior to the completion of the semester following the excused absence) with the instructor's procedure of determining Credit/No Credit (minimum grade of 65 required for J.D. candidates and 75 for LL.M. candidates) or (2) having the grade *I* (Incomplete) entered on the record and taking the next regularly scheduled examination for a numerical grade. The examination may not be taken after exclusion for low scholarship.

Permission to take an examination before the regularly scheduled date will not be granted. Permission to take a postponed examination is limited to the situations provided for in the preceding paragraph.

A student who has been excused from taking a regular examination and who is a candidate for a degree to be conferred prior to the next regular examination in the subject may petition the Scholarship Committee, which may authorize such action as the circumstances require.

If a student fails to take an examination, a grade of 45 will be recorded unless the student has been excused from the examination as provided above or has obtained the Dean's permission to drop the course.



CREDIT/NO CREDIT OPTION

Candidates for the degree of Juris Doctor may take, in addition to cours regularly given on a Credit/No Credit basis, 12 semester hours of elective cour work on a Credit/No Credit basis; a grade of Credit will be recorded if the co is satisfactorily completed with a grade of 65 or better. The final date for election of Credit/No Credit in an elective graded course will be the Friday of eighth week of a semester, the Friday of the fourth week of a six-week summ session, or the Friday of the seventh week of a 13-week summer session. unexcused failure to take an examination in a course or failure to submit required research paper will result in the recording of a grade of 45 for a cours taken on a Credit/No Credit basis.

No student may take more than 17 semester hours of courses (including Law 220 and other courses regularly given on a Credit/No Credit basis) on a Credit/No Credit basis.

Students are advised to consider carefully the advisability of electing to take courses on a Credit/No Credit basis. In the opinion of the faculty, a student's election to take courses on a Credit/No Credit basis may, in view of the importance apparently attached to grades by educational institutions and employers, be detrimental to the student's career in the legal profession.

GRADES

Grades are given in numerical terms equivalent to letter grades as follows: 85–10 *A*, Excellent; 75–84, *B*, Good; 65–74, *C*, Satisfactory; 55–64, *D*, Poor—belo standard for graduation; 45–54, *F*, Failure. In Law courses 220, 321–22, 323, 34 343, 345, 346, 385, 399, 459, 479, 509, 579, 593, and 620 grades are *CR* Credi (minimum grade of 65 required for J.D. candidates, 75 for LL.M. candidates); *N* No Credit. In Law 220, the grade of *H* (Honors) may be earned for work o excellent quality. A student who has been excused from taking a regularly scheduled examination is given the grade of *I*, Incomplete. See Examinations (above) for grade upon failure to take an examination. Grades between 55 and 10 indicate that the work has been completed and credit given. Grades between 55 and 64, however, do not represent satisfactory work and adversely affect a student's cumulative average. No credit is given to J.D. and M.Comp.L. candidates for grades below 55 or to LL.M. candidates for grades below 65. No grade may be changed by an instructor after it has been posted in the Law Center or disclosed to a student unless there has been an error in arithmetic certified in writing as such by the instructor.

Any student who receives a grade below 55 (*F*) has the right to retake the course once, from the same or a different instructor, but only within the next academic year. (This does not apply to post-J.D. students.) The grade received in the retaken course is entered into the student's record in addition to the original grade and both grades are included in computing the student's average. A student may exercise the right to retake a course only with respect to two different courses during study at the Law Center.

The cumulative average of a student includes all grades in all courses taken while a candidate for a particular degree.

EXCLUSION AND PROBATION FOR POOR SCHOLARSHIP

Candidates for the Degree of Juris Doctor—A student whose cumulative average at the end of any semester falls below 65.0 but is above 64.0 will be put on probation. If such a student fails to raise the cumulative average to 65.0 at the end of the next semester, the student will not be permitted to register for any

succeeding semester unless he or she petitions for and receives the permission of the Scholarship Committee.

A student whose cumulative average at the end of any semester falls below 64.0 will not be permitted to register for any succeeding semester unless the student petitions for and receives the permission of the Scholarship Committee to register.

A student who fails or receives a grade of No Credit in more than one course over the entire period of law study will not be permitted to register for any succeeding semester or to graduate unless the student petitions for and receives the permission of the Scholarship Committee.

A student who is not permitted to register under the foregoing provisions will be excluded as of the beginning of the semester for which he or she was ineligible to register.

Students who are registered at the time they receive notice that they will not be permitted to register for the next semester are entitled to withdraw from school and to receive a full refund of the tuition paid for the semester or to complete the work for which they are registered.

Any student excluded may petition for reinstatement; if the student can demonstrate that the low grades were due to circumstances beyond his or her control and that he or she has the capacity to pursue the study of law with a definite likelihood of success, that student may be readmitted subject to such conditions as may be imposed by the Scholarship Committee.

Despite the above provisions, a student will be allowed to complete the first two semesters of law study before being denied permission to register for a succeeding semester.

For this purpose the term "semester" includes a session of the summer term.

Candidates for Master's and Doctoral Degrees—A candidate for a Master's or doctoral degree whose work is not satisfactory in the opinion of the faculty, taking into consideration the requirements and standards for the degree, may, by action of the faculty, be excluded at the end of the semester for which the candidate is currently registered.

A cumulative average of 78 is required for the Master of Laws degree and a cumulative average of 65 for the Master of Comparative Law degrees. A student whose cumulative average falls below the required minimum at any time will be ineligible for continuation in the program without the permission of the Dean. Such a student will not be permitted to register for any succeeding semester unless the student petitions for and receives the permission of the Dean or the Board for Graduate Studies.

Unclassified Students—An unclassified student whose work is not satisfactory may be excluded at the end of the semester for which the student is currently registered.

SUMMER SCHOOL CREDIT

Students planning to attend summer sessions at other law schools and desiring to use the credit toward their Juris Doctor program at the Law Center must first have the courses they wish to take approved by the Dean. Students may not take courses in summer sessions at other law schools in this vicinity if the same courses are being given during the summer sessions at the National Law Center. In no event will credit be given for unsatisfactory work or be recognized in excess of that which might be obtained in a similar period in this program. Students who register at another law school must provide the Dean with an official transcript of their work there promptly on its completion.



TRANSCRIPTS OF RECORD

Official transcripts of student records will be issued on request of the student or former student who has a clear financial record. A fee of $2 is charged for each transcript. When more than two transcripts are ordered at the same time, a $2 fee is charged for each of the first two transcripts and a 50¢ fee is charged for each additional transcript.

CONTINUOUS ENROLLMENT

Degree candidates are expected to maintain continuous enrollment until all degree requirements are satisfied. By failing to register for one semester or more the student breaks registration and must be readmitted (see Readmission page 28). A readmitted student is required to satisfy the curriculum requirements existing at the time of readmission.

GRADUATION REQUIREMENTS

Diplomas are awarded in February, May, and September.

To be recommended by the Faculty for graduation, a student must have met the admission requirements of the National Law Center; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which the student is registered; and be free from all indebtedness to the University. Registration is required for the semester or summer session at the close of which the degree is to be conferred.

Application for Graduation—An Application for Graduation form must be filed at the time of registration for the last semester or summer session of the final year. Students completing degree requirements during the summer sessions will be awarded diplomas (no formal convocation) September 30, *provided* they have completed all degree requirements and have applied for graduation as a part of registration for the summer sessions. If they wish, such students may participate in the Winter Convocation.

ACADEMIC DISHONESTY

The University community, to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are a legal, moral, and intellectual offense against the community and will be prosecuted through the proper University channels.

Copies of the University policy on academic dishonesty can be obtained from the following offices: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

UNIVERSITY POLICY ON THE RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions that are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must:

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. receive the student's written consent before releasing information from his or her education records to persons outside the University, except for directory information as indicated below. Information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and
4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: name; local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height and weight of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

RIGHT TO CHANGE RULES

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

RIGHT TO DISMISS STUDENTS

If a student knowingly makes a false statement or conceals material information on an application for admission, registration form, or any other University

document, the student's registration may be canceled and the student will be ineligible (except by special action of the Faculty) for subsequent registration.

The right is reserved by the University to dismiss or exclude any student from the University or from any class or classes whenever, in the interest of the student or the University, the University Administration deems it advisable.

RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

PROPERTY RESPONSIBILITY

The University is not responsible for the loss of personal property. A Lost and Found Office is maintained on campus in the Safety and Security Office.

STUDENT CONDUCT

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Statement of Student Rights and Responsibilities* which outlines student freedoms and responsibilities of conduct, the Judicial System for Non-Academic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University, which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

UNIVERSITY POLICY ON DRUGS

The University cannot condone violations of the law, including violation of those laws that proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken in order to protect the interests of the University and the rights of others.

CENTER FOR ACADEMIC AND ADMINISTRATIVE COMPUTING

The Center for Academic and Administrative Computing (CAAC) is located in the Academic Center, 801 22nd St., N.W. CAAC facilities are normally available 24 hours a day during the academic year, to all faculty, staff, and students.

CAAC encourages interest in computers by providing computing facilities and by offering short courses and technical assistance. Any University student may have access to the computer facilities for individual research, class projects and thesis or dissertation study. Access is by request; the schedule of charges is available at CAAC.

CAAC maintains two IBM 4341s (VM/SP and OS/VS1). A full range of compilers and application software packages is available including (but not limited to) CMS XEDIT, FORTRAN, COBOL, PL/1, PASCAL, APL, SPSS, SAS, BMDP, ASSEMBLER, ASSIST, and SCRIPT. In addition, CAAC provides an easy-to-learn, terminal-based text-editing system on a PDP 11-70 computer.

Computer programming courses are offered primarily by the School of Government and Business Administration, the Department of Statistics, Comput-

er and Information Systems, and the School of Engineering and Applied Science. In addition, many other departments offer courses that utilize the computer as a research adjunct to course work.

STUDENT SERVICES

RESIDENCE HALLS

The University does not provide regular residence hall space for graduate students. However, the Housing and Residence Life Office refers graduate students to apartments as they become available in University-owned buildings in the campus area. Additionally, the Housing and Residence Life Office operates an Off-Campus Housing Resource Center, and attempts to provide information and assistance for those seeking accommodations. For complete information on this service, as well as apartment guides and referrals, interested applicants should contact the Director of Housing and Residence Life, George Washington University, Washington, D.C. 20052.

FOOD SERVICE

Contract food service is available from August to May, and is based on the undergraduate academic calendar of registration, exams, and vacation periods. Accommodations for the law school calendar are made. The rate for the seven-day, 19 meals per week plan has been set at $1,830. The any 14 meals per week plan costs $1,762, the any 10 meals per week plan, $1,714, and the any 7 meals per week plan, $1,682. Contract service is cafeteria style and provided in two residence halls and the Cloyd Heck Marvin Center. Meal coupons may also be used on a cash-equivalency basis in the Marvin Center first floor cafeteria and in George's on the fifth floor.

CLOYD HECK MARVIN CENTER

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board, the departments offering course work in the performing arts, and other student and faculty organizations.

The Center Governing Board, representing varied segments of the University community, plays an important role in the day-to-day functioning of the Center. This Board works closely with the full-time staff in the development of procedures and policies that provide a framework for the Center's operation.

STUDENT HEALTH SERVICE

The Student Health Service is an outpatient clinic located at 908 New Hampshire Ave., N.W.

The Health Service is staffed by physicians, nurse practitioners, and physician assistants who are capable of addressing most of students' medical problems. Visits are cost-free and may be either arranged by appointment or, during certain hours, secured on a walk-in basis. Most routine laboratory tests may be performed in the Health Service lab at cost, many common medications are stocked to fill students' prescriptions, and allergy shots and immunizations are administered by the staff nurse for a minimal charge. A psychiatrist works in the Health Service to assist students with mental health concerns.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University

Hospital for treatment. This arrangement is for emergency care only and all fee are the responsibility of the student.

Students must be currently enrolled on campus in the University to rece treatment at the Student Health Service. Students enrolled in off-campus pr grams and the Continuing Engineering Education Program are not eligibl Students who so desire may engage physicians and nurses of their own choic but these students will be responsible for all fees charged. The bills incurred fro all services rendered outside of the Student Health Service (for example x-ra work, laboratory work, and referrals to specialists or other outside physicians a the responsibility of the student.

Health and Accident Insurance

The University has arranged for and endorsed group health and accident insurance, on an elective basis, for those students who do not have othe coverage. Interested students should contact the Student Health Service or Office of the Dean of Students.

STUDENT EMPLOYMENT

A student taking more than 10 semester hours must limit outside employment to not more than 20 hours (see Academic Work Load, page 35). It is urged that al full-time students refrain from engaging in outside employment during their firs year. Although work in some special areas may contribute to the learning and experience of the student, as a general rule it will compete with time needed fo adequate study and preparation, which are at the heart of a good legal education

CAREER DEVELOPMENT AND PLACEMENT SERVICES

The Law Center's Dean, Faculty, and Career Development Office cooperate in providing a full range of services that support the career decision-making process of both students and alumni. The Career Development Office serves students alumni, and prospective employers through a variety of programs: systems of job vacancy advertising; newsletters of current career information; individual and group counseling on resume preparation, interviewing skills development, and job-search strategy; maintaining a career development resource library; and planning and presenting forums covering legal career topics as well as alternative career options. A strong on-campus interviewing program is organized in the fall of each academic year to provide prospective employers the opportunity to interview second-year students for summer positions and third- and fourth-year students and LL.M. candidates for permanent positions. In 1984, participating employers represented 125 cities from 41 states, Puerto Rico, and the Virgin Islands and included private law firms, legal services offices, corporations government agencies, accounting firms, and District attorneys' offices.

During the fall of 1984, the Career Development Office conducted regional off-campus interviewing programs in New York City, Boston, Philadelphia, Dallas and Houston (the two latter programs were offered in cooperation with the Georgetown University Law Center). The regional interviewing effort will be expanded to Chicago in 1985 and possibly the West Coast in 1986.

The National Law Center is a member of two law school consortia groups that sponsor additional career-support programs. The Consortium of Washington D.C., Area Law Schools holds an annual Public Service/Interest Day during the spring semester. This year more than 25 employers from government agencies public interest organizations, and legal services offices interviewed students through this program for specific job openings. An additional 25 organizations arranged a visit to D.C. to talk with students about careers in their fields o practice. The D.C. Consortium also sponsors a fall Corporate Interviewing Day

which, in 1984, drew employers from industries such as banking, oil and gas, steel, data processing, accounting, and insurance. The Mid-Atlantic Consortium for Law Placement, a group involving 11 other law schools from the mid-Atlantic region, sponsored its first spring interviewing day on March 1, 1985. The program drew small- and mid-sized firms from a variety of cities nationwide. Plans are already under way for the second annual interviewing day to be held in Washington, D.C., on Friday, February 28, 1986. Again, this program will be directed toward the smaller-firm employment market to provide students interested in such environments an opportunity to interview with prospective employers in a career-day setting.

The Career Development Office publishes a newsletter, *Noteworthy*, that is distributed to all students to keep them informed of upcoming programs, deadlines, general career news, trends in hiring, new bar examination rule changes, and other pertinent information.

Every year in February, the Career Development Office conducts a survey of the previous year's graduates. Responses from 333 members of the 1984 graduating class showed 57% in private practice, 18% in local, state, or the federal government, 10% in business and industry, 10% in judicial clerkships, 1.4% each in the military and public interest, .3% in academic positions, and the remainder in other positions. The highest concentration of graduates (64%) is in the South Atlantic states, which include Delaware, the District of Columbia, Maryland, Virginia, West Virginia, and the states along the Eastern seaboard to Florida. New York, New Jersey, and Pennsylvania are home to 14%, and 6% are located in the New England states. The Pacific coast states (including Hawaii) drew an additional 6%, and the West South Central states attracted 4%. Small percentages went to a number of other states.

VETERANS BENEFITS

The veterans counselor, located on the third floor of Rice Hall, 2121 Eye Street, N.W., assists students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any problems that may arise concerning their benefits. This office also processes certification of enrollment and attendance to the Veterans Administration so that monthly allowances will be paid.

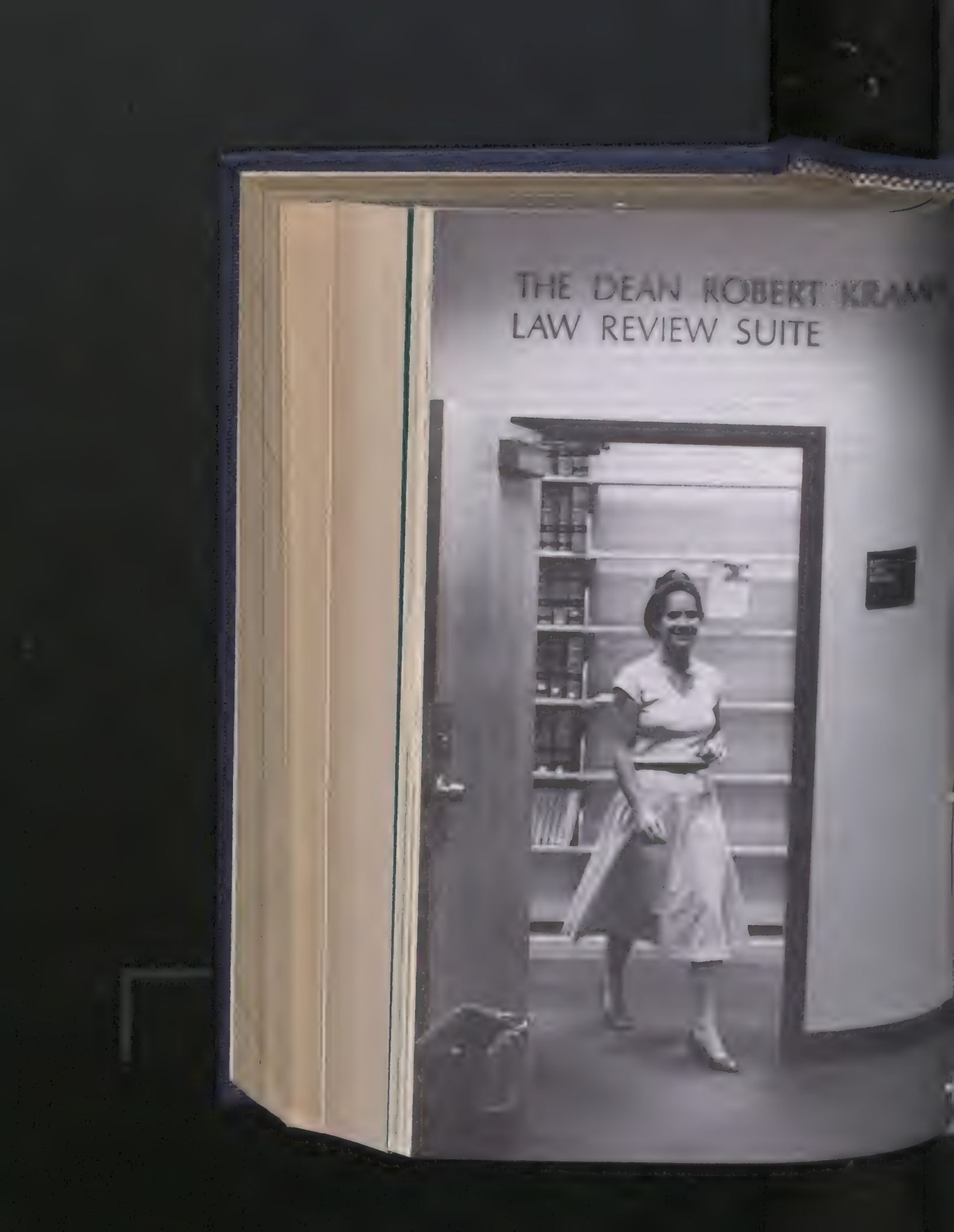
When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the Office of the Registrar, which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration, and which includes other information of general interest. The Veterans Administration is at 941 N. Capitol St., N.E., Washington, D.C. 20421.

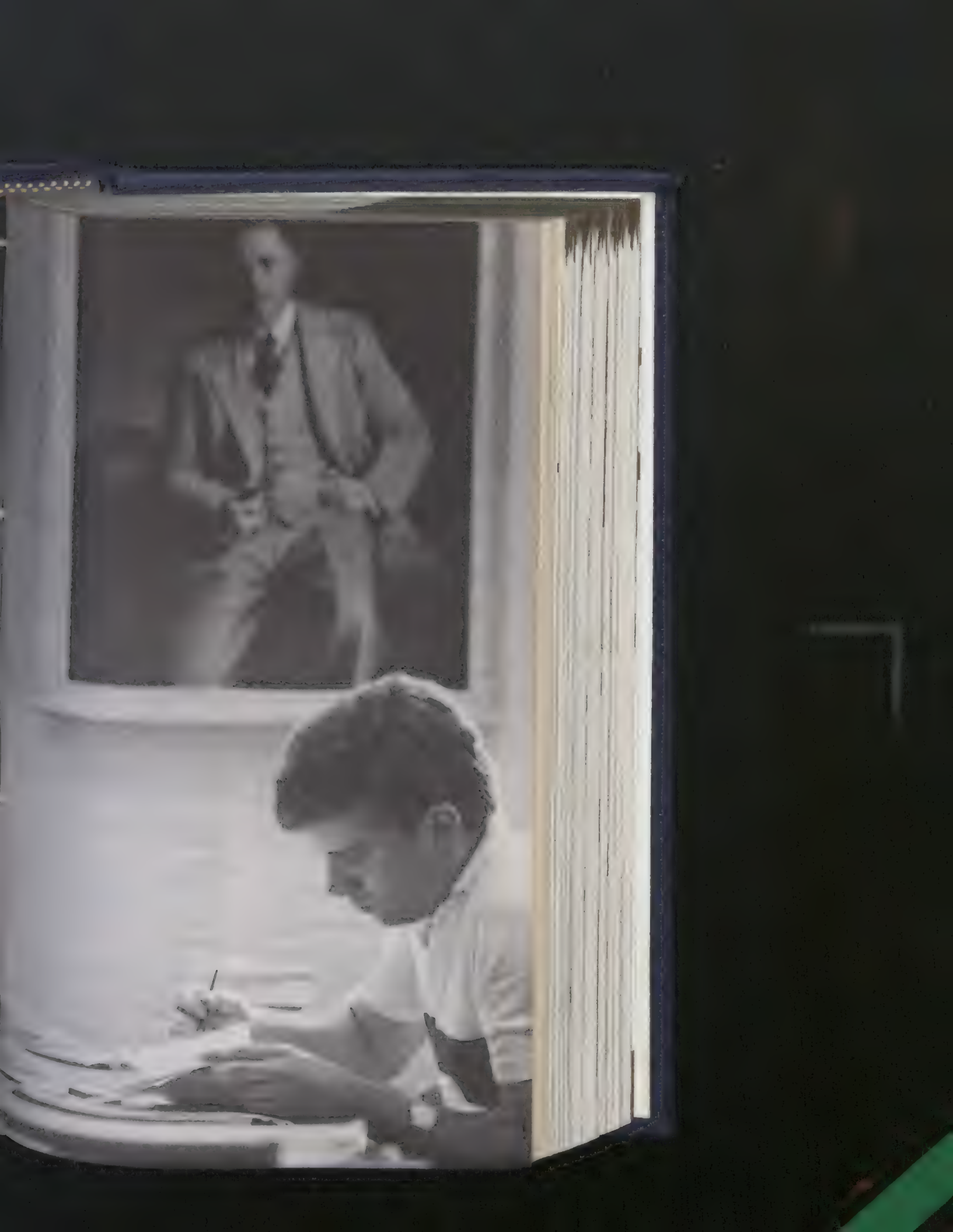
DISABLED STUDENT SERVICES

The Director of Disabled Student Services coordinates advising, orientation, and special services that address the needs of disabled students. The Director also serves as a central point of contact from which the University community may obtain information and assistance in serving disabled students. A resource library maintained in the office is available for general use.

In addition to coordinating a program of general assistance to promote integration of disabled students as fully as possible into the life of the University community, the Director administers reading and sign language services for those with visual and auditory handicaps.

The office is located on the fourth floor of Rice Hall, 2121 Eye Street, N.W.


THE DEAN ROBERT
LAW REVIEW SUITE



COURSES OF INSTRUCTION

CAREER PLANNING AND COURSE SELECTION

One of the great strengths of the National Law Center is the diversity of its cour offerings and the flexibility it offers students to design their programs to fit th interests and career plans. Every spring a series of counseling sessions is held provide students with an overview of course offerings in various areas of the la and to assist them in selecting courses and defining their career objective Students also may consult members of the faculty for course and career planning In addition, the Career Development Office provides a central storehouse information regarding many types of legal careers.

The Law Center's broad offering of elective courses is listed below. Course numbered 500 and above are generally more advanced, but are open to second and third-year students who have taken the prerequisite courses. Both second and third-year students may take more than one such course with the permission of the Dean.

Among the courses offering clinical work are: Law 414, 460, 483, 492, 493, 495 496, 497, 498, and 596.

The courses of instruction listed below are subject to change. The University reserves the right to withdraw any course announced.

ELECTIVE COURSES AND SEMINARS (300–499)

Administration of Criminal Justice Seminar (307)
Administrative Law (342)
Administrative Law Seminar (344)
Admiralty (386)
Advanced Civil Procedure: Complex Litigation (308)
Advanced Criminal Procedure (305)
Advanced Legal Writing Seminar (316)
Agency and Partnerships (322)
American Legal History Seminar (318)
Appellate Practice and Procedure (304)
Banking Law (332)
Business Planning (334)
Civil Procedure Seminar (310)
Clinical Law Work (492)
Clinical Studies in Environmental Law (414)
Clinical Studies in Urban Law (497)
Collective Bargaining and Labor Arbitration (340)
Commercial Paper, Check Collection, and Banking (372)
Community Property/Marital Property (394)
Comparative Law (438)
Computers and the Law (468)
Conflict of Laws (440)
Constitutional Law Seminar (350)
Corporations (327)
Creditors' and Debtors' Rights (378
Current Decisions (364)
Current Problems in Land Use Controls Seminar (403)
Disabled People and the Law (482)
Domestic Relations (434)
Drugs and the Law Seminar (474
Environmental Law I (410)
Environmental Law II (411)
Estate Planning Seminar (395)
Federal Antitrust Laws (452)
Federal Jurisdiction (300)
Government Contracts Seminar (489
Government Contracts (486)
Government Procurement Law (487
Immigration Law (360)
Individual Rights and Liberties (358
Insurance (382)
International Business Transactions Legal Aspects of (446)
International Law and World Order (444)
International Law Seminar (448)
Introduction to International Economic Law (445)
Journal of International Law (366
Jurisprudence (442)
Labor Law (338)

Labor Law Seminar (341)
Land Development Law (408)
Land Use Control (402)
Law and Accounting (324)
Law and Criminology I (478)
Law and Medicine (472)
Law and Psychiatry Seminar (437)
Law and the Deaf Clinical Education Activities (483)
Law of Congress and the Presidency Seminar (347)
Law, Science, and Technology Seminar (475)
Law Students Civil Rights Research Council (496)
Law Students in Court (495)
Legal Activism (498)
Legal Aid (493)
The Legal Process (320)
Legal Writing (314)
Legislation (362)
Mediation (303)
Medicine for Lawyers (470)
The Modern Corporation Seminar (336)
Modern Real Estate Transactions (398)
Moot Court (312)
Occupational Safety and Health Legislation (415)
Patent Law (464)
Patent Office Practice (466)
Performance of Government Contracts (488)
The Police and the Community (480)
Problems of Tax Policy Seminar (428)
Problems of the Consumer (460)
Product Liability (454)
Public Policy and Mass Media (352)
Remedies (380)
Sales and Sales Financing (370)
Securities Aspects of Corporate Finance (326)
Securities Regulation (328)
Taxation—Federal Estate and Gift (422)
Taxation—Federal Income (420)
Taxation—Federal Income, Corporations and Shareholders (424)
Taxation—Partnerships and Subchapter S (426)
Trade Regulation Seminar (462)
Trial Practice Court (302)
Trusts and Estates I (390)
Trusts and Estates II (391)
U.S. Foreign Relations Law (443)
Unfair Trade Practices (450)
United Nations Law and World Order (447)
Women and the Law (484)

ADVANCED COURSES AND SEMINARS (NUMBERED 500–699)

Accounting Aspects of Federal Income Taxation (573)
Administrative Practices and Procedures (Food and Drug Administration) (510)
Banking Institutions and Their Role in Real Estate Investments (538)
Chinese Law (570)
Control of Toxic and Hazardous Substances (548)
Copyright Law (559)
Crime Lab, the Forensic Scientist, and the Criminal Lawyer (532)
Energy (549)
Environmental Planning (544)
Equal Employment Claims and Litigation (527)
Equal Employment Opportunity (524)
Food and Drug Law (509)
Graduate Clinical Studies (596)
Health Care Delivery Systems Seminar (508)
Independent Studies (597)
Intergovernmental Relations I (541)
Internal Union Affairs (522)
International and Comparative Patent Law (558)
International Humanitarian Law of Coercion Control (568)
International Law of Air and Space (566)
International Law of Human Rights (565)
International Law of the Sea (567)
Labor Litigation Seminar (526)
Labor Relations in the Federal Service (521)
Labor Standards (520)
Law of Criminal Corrections (535)
Legal Research and Writing (Foreign Students) (620)
Legal Research and Writing (Foreign Students) (621)
Legislative Drafting (591)
National Labor Relations Board Procedures (523)

Natural Resources Law (546)
Negotiation: Concepts and Techniques (563)
Pollution Control Law (547)
Practical Economics for Lawyers (500)
Public Economic Policy and the Law (501)
Public-Sector Labor Law Seminar (529)
Regulation of Investment Advisors and Investment Companies (507)
Research in Patent, Trademark, and Copyright Law (555)
Research in Public Law (598)
Soviet Law (569)
Survey of Mortgage Finance (539)
Tax Practice and Procedure Seminar (588)
Taxation—Capital Gains and Losses (584)
Taxation—Deferred Compensation I (586)
Taxation—Deferred Compensation II (587)
Taxation—Exempt Organizations (578)
Taxation—Principles of Charitable Tax Planning (582)
Taxation—Real Estate and Income (579)
Taxation—Special Corporation Problems (577)
Taxation—State and Local (581)
Thesis (599)
Thesis (600)
U.S. Regulation of International Trade (505)
U.S. Trademark Law (560)
Use and Control of Nuclear Energy (550)
Water Resources Law (543)

COURSES NOT OFFERED 1985-1986

Advanced Topics in Patent Law (554)
Chemical Patent Practice (553)
Child, Family, and State (436)
Comparative Labor Law (518)
Criminal Practice Seminar (534)
Environmental Litigation (545)
Income Taxation of Foreign Business and Investment (583)
Intergovernmental Relations II (542)
Law and Criminology II (479)
Law of Privacy (469)
Law of the Near East (571)
Legal Process (320)
Patent and Know-how Licensing (552)
Regulated Industries (345)
Regulation of Securities Markets (325)
Taxation—Oil and Gas (580)

COURSE DESCRIPTIONS

The courses of instruction are described below. The number of hours of credit given for the satisfactory completion of a course is indicated in parentheses after the name of the course. Thus, a year course giving two hours of credit each semester is marked (2–2) and a semester course giving two hours of credit is marked (2).

In most courses, a final examination is held during the examination period and the grade in the course is determined in large part by that examination. These courses are parenthetically marked "Examination."

Courses that require the preparation of a major research paper in lieu of an examination are parenthetically marked "Research Paper." The satisfactory completion of such a paper by a student individually will satisfy the Legal Writing curriculum requirement for the J.D. degree.

Courses parenthetically marked "Problem Assignments," "Writing Assignments," "Take-home Examination," "Choice of Paper or Examination," or "Clinical Work" indicate the nature of the method planned by the instructor for determining in major part the grade to be given for the course. Only research papers qualify for the Legal Writing curriculum requirement for the J.D. degree.

Day classes begin at 9:10 a.m. and run throughout the entire morning and afternoon. Evening classes begin at 5:50 p.m. Many examinations for both day and evening classes may be given in the afternoon only. Examinations for day students may be held in the evening.

A parenthetical designation at the end of a course description indicates whether the course is scheduled to be offered in the spring or fall semester or in the summer sessions, and also usually whether it will meet in the day or evening. When a double-numbered course is designated "Academic year," the first half of the course is scheduled to be offered in the fall, the second half in the spring.

REQUIRED COURSES

203–4 **Contracts I-II** (4–2) Nash, Cibinic, Pock, Caplan, Carroll, St. Antoine
Legal remedies of contracting parties, including damages in contract and quasi-contract, specific performance, reformation, rescission, remedies in tort; acts creating and terminating contractual rights, including offer and acceptance, mistake, problems of proof; function of consideration; conditions; assignments; third-party beneficiaries; effect of changed circumstances; protection of the client's interests upon breach or threat of breach by the other party. Emphasis on problems of analysis, draftsmanship, adversary method. (Examination) (Academic year—day and evening)

207 **Torts** (4) Seidelson, Banzhaf, T. Schwartz, Sirulnik, Reitze, Dienes
Liability for harm to person or property. Intentional torts, negligence, nuisance, products liability, misrepresentation, defamation, and invasion of privacy; fault and other basis for shifting losses; causation; damages; effects of liability insurance; problems under Federal Tort Claims Act. (Examination) (Fall—day and evening)

211 **Property** (4) Starrs, Schiller, Brown, Chandler, J. Schwartz
Basic concepts of personal property. Real property: historical background of the law of estates and conveyancing, types of estates, dower and curtesy, landlord and tenant relationship, concurrent estates, future interest at common law and after the Statute of Uses, introduction to modern conveyancing—the real estate contract, the deed, the recording system, methods of title assurance. (Examination) (Fall—evening; spring—day; summer 1985)

212 **Constitutional Law** (4) Barron, Park, Cheh, Dienes, Nolan
Basic principles of American constitutionalism; judicial function in constitutional cases; implementation of doctrines of separation of powers, federalism, limited government; development and exercise of national powers; introduction to civil rights and liberties. (Examination) (Spring—day and evening)

215 **Criminal Law and Procedure** (4) Starrs, Robinson, Zenoff, Sirulnik, Caplan
Purposes of criminal law, elements of criminal liability, selective consideration of specific crimes, introduction to criminal procedure. (Examination) (Fall—day; spring—evening)

218 **Civil Procedure** (4) Sharpe, Barron, T. Schwartz, Kayton, Cheh, Raven-Hansen, Reitze, Trangsrud, J. Schwartz, Whitner Hoptman
Mechanics of litigation—rules that govern the process by which rights and duties studied in substantive law courses are enforced; pleadings, discovery, pre- and post-trial motions, jurisdiction and venue, equity jurisdiction and trial by jury, former adjudication. Emphasis on Federal Rules of Civil Procedure, but principles and main problems indigenous to all procedural systems are developed. (Examination) (Spring—day and evening)

220 **Legal Research and Writing** (2) Staff
Introduction to use of a law library; research experience in primary, secondary, and specialized sources of law; practice in proper legal citation form. Instruction and practice in legal writing. The grade *H* (Honors), *CR* (Credit), or *NC* (No Credit) is given for this course. For Honors, a student must do work of excellent

quality. For Credit, a student must attain a minimum grade of 65. Failure
complete the work in this course will result in a grade of 45. (Fall—day a
evening)

221 Moot Court (1) Sta

Instruction and experience in the writing and rewriting of an appellate co
brief and in the argument of an appellate case. This course must be successfu
completed in order to earn credit for Law 220. The grade *H* (Honors), *Cr* (Credi
or *NC* (No Credit) is given for this course. For Honors, a student must do work
excellent quality. For Credit, a student must attain a minimum grade of
Failure to complete the work in this course will result in a grade o
45. (Spring—day and evening)

222 Professional Responsibility and Ethics (1) Cibinic, Green, Jenkins, Zenoff, Nola

Required prior to graduation for all students entering in the fall 1983 semest
and thereafter. May be taken in the second, third, or fourth years. Ethica
problems involved in civil and criminal counseling and litigation. Codes o
Professional Responsibility and legal discipline; roles of bar associations and
courts. (Examination) (Fall and spring—day and evening)

232 Evidence (4) Seidelson, Robinson, Park, Schechter

Preparation and presentation of evidence, including proof of writings; qualifica
tion and examination of witnesses with emphasis on impeachment; privileges
opinion testimony; determination of relevancy, demonstrative experimenta
scientific evidence; application of the hearsay rule. (Examination) (Spring—
day and evening)

ELECTIVE COURSES

300 Federal Jurisdiction (2) Lowther, Barron, Kayton
(Formerly Law 332) Raven-Hansen, Trangsrud, Whitner Hoptman

Relationship of federal courts to Congress and to the states, through analysis o
cases dealing with federal judicial functions (including problems of advisory
opinions, standing to litigate, justiciability), federal questions in federal courts
federal review of state court decisions (including relation between state and
federal substantive law, procedural problems in exercising review, application
of law to fact). The grade *CR* (Credit) or *NC* (No Credit) only is given in sections
taught by Lowther. Lowther—(Problem Assignments) (Fall—day; spring—day
and evening)

302 Trial Practice Court (2) Pryor, Ryan, Kendrick, Boswell, Stevas
(Formerly Law 385) Seidel, Barnes, Jamborsky, Jackson

Trial of assigned cases, trial techniques, pre-trial and courtroom procedures
pursuant to federal rules. Students may repeat this course once for credit.
Prerequisite: 42 semester hours, including Law 218. Prerequisite or concurrent
registration: Law 232. The grade *CR* (Credit) or *NC* (No Credit) is given for this
course. (Fall and spring—day and evening)

303 Mediation (2) Lewis, Singer
(Formerly Law 376)

Consideration of the growing use of mediation to resolve disputes. Comparison
of mediation with other forms of dispute resolution; applicability to various
areas of the law, including family, criminal, environmental, and civil rights.
Students participate in simulated disputes, both in and outside class, designed
to familiarize them with the process of mediation and to raise a number of
practical and ethical questions about its applications. Students keep short
journal entries describing their experiences as mediators or disputants and
write a 10–20 page paper either exploring a particular application of mediation
or discussing legal or ethical questions involving mediation. Enrollment limited
to 24. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. Fall—
day)

304 **Appellate Practice and Procedure** (2) Markey
(Formerly Law 388)
Study through text and an examination of the appellate process. The course is centered around the discussion of a series of fundamental concepts. (Research paper) (Fall—evening)

305 **Advanced Criminal Procedure** (2) Starrs, Robinson, Zenoff
(Formerly Law 334)
Decision to arrest, prosecutive discretion, bail, the preliminary hearing, right to a speedy trial, discovery, plea bargaining, publicity, post-conviction procedures. Starrs—(Examination and Problem Assignments); Robinson, Zenoff—(Examination) (Fall—evening)

307 **Seminar: Administration of Criminal Justice** (2) Caplan
(Formerly Law 472)
An inquiry into the origins and implementation of the Fifth Amendment, primarily the application of the privilege against self-incrimination as it affects custodial police interrogation. (Research Paper) (Spring—day)

308 **Advanced Civil Procedure: Complex Litigation** (3) Trangsrud
(Formerly Law 333)
Complex civil litigation in the federal courts, modern class actions, and the use of the injunction as a tool for institutional reform and the implementation of public policy. Emphasis on one or more of the following topics: modern injunction theory; alternative procedures for managing complex public and private litigation; the issues of representation, class conflicts, and judicial supervision of plaintiff and defendant class actions; the role of juries, magistrates, and masters in complex cases; government by injunction in free speech cases and in the reform of public schools, hospitals, and prisons; and the use of the contempt sanction. (Examination) (Fall—day and evening)

310 **Seminar: Civil Procedure** (2) Whitner Hoptman
(Formerly Law 305)
Study of specific problems in civil procedure. Topics will vary. The topic will be announced each year prior to registration. (Research paper) (Spring—day)

312 **Moot Court** (1 or 2)
(Formerly Law 342)
Satisfactory participation in the upper-class competition results in one hour of academic credit. Finalists in the upper-class competition receive two hours of academic credit. Finalists in the first-year competition receive one hour of academic credit. No academic credit is awarded to nonfinalists in the first-year competition. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring)

314 **Legal Writing** (1 or 2) Staff
(Formerly Law 344)
Preparation of a research paper under the supervision of a full-time member of the faculty who will determine, prior to registration, whether the work required for the topic selected justifies one or two semester hours of credit. If elected for one hour of credit, this course may be repeated to meet the legal writing requirement for the degree. Approval of the faculty member is required prior to registration. See recommended guidelines under Regulations, Research Papers. (Research Paper) (Fall and spring—as arranged; summer)

316 **Advanced Legal Writing Seminar** (2) Zenoff
(Formerly Law 380)
Constitutional law, criminal law, and psychiatric aspects of criminal offenders are the central themes from which paper topics will be selected for this seminar. Instruction in improving skills in such areas as legislative research, use of interdisciplinary materials, editing and critiquing manuscripts. The seminar fulfills the advanced legal writing requirement. (Spring—day)

318 **Seminar: American Legal History** (2) Lowther
(Formerly Law 593)
From the outbreak of the Revolution at Lexington and Concord to the death of

John Marshall. An examination of men, events, and movements significan the unfolding of our laws and legal institutions in this formative period of national life, including a critical examination of the place of the lawyer revolutionary age. Comparison of the role of the lawyer during the politic and socially unsettled time of Marshall with the role of the lawyer in tod troubled scene. Members of the seminar present the results of their resea and thought by either oral or written reports. The grade *CR* (Credit) or *NC* Credit) is given for this course. (Problem Assignments) (Fall—day)

320 The Legal Process (3) Robinson, Levi
(Formerly Law 315)
American legal institutions and their interrelationships and processes. Jud prudential concepts in the context of specific problems commonly faced private and governmental lawyers, legislators, courts, and administrative age cies. Issues of statutory interpretation, the roles of courts in making new la and the allocation of functions between courts, administrative agencies, legisla tures, and private decision makers. (Examination)

322 Agency and Partnerships (2) Sharpe, Schiller
(Formerly Law 311)
Employment relations, vicarious liability of employers for employees' tort scope of employment, and independent contractors; agents' authority an apparent authority to contract for their principals, ratification, nonprofit associations; the formation, operation, and termination of partnerships; limite partnerships. (Examination) (Fall—day and evening)

324 Law and Accounting (2) Cibinic, Taubman, Seligman
(Formerly Law 351)
Study of fundamental accounting principles with emphasis on corporate accounting; legal and accounting implications of specific items in finance statements of corporations; inventory adjustments; corporate transactions distributions, capital adjustments. Strongly recommended for students who have had no accounting. (Examination and Problem Assignments) (Fall evening)

325 Regulation of Securities Markets (2)
(Formerly Law 405)
Operation of over-the-counter and exchange markets, including competitive and monopolistic practices in each market; relationship of antitrust laws and securities regulations to concept of a free and open market place; role o regional exchanges and third market in providing competitive element in market; advantages and disadvantages of a fragmented market; minimum re structure; rebates and their effect on merchandising of securities and financia soundness of industry; use and availability of economic data in evaluating performance of market place. The seminar will examine matters directly o interest to graduate law students, lawyers, economists, and political scientists (Take-home Examination)

326 Securities Aspects of Corporate Finance (2) Seligman
(Formerly Law 406)
Federal and state regulation of securities transactions, such as tender offers, the regulation of investment companies, and new types of securities markets including the options and futures markets. Prerequisite: Law 312 and 404 (Research Paper) (Spring—day)

327 Corporations (4) Green, Solomon, Park, Cheh, Seligman
(Formerly Law 312)
Corporate law, with emphasis on operations and financing of corporations Control of corporations, action by corporate directors, officers, shareholders Control devices. Directors' and shareholders' duties of care and loyalty insiders' transactions in shares of the corporation. Derivative suits, kinds of shares, dividends, corporate distributions. (Examination) (Fall—day and evening)

328 **Securities Regulation** (3) Green, Seligman, Black, McCaw
(Formerly Law 404)
The basic course in the study of federal and state laws governing the offering, distribution, and trading of securities. Focus on federal laws and regulations, in particular the Securities Act of 1933, the Securities Exchange Act of 1934, and the enforcement of these laws by the SEC and private parties. (Examination) (Spring—day and evening)

332 **Banking Law** Clark
(Formerly Law 316)
Federal regulation of the financial services industry, especially commercial banks. Includes an analysis of the Federal Deposit Insurance Corporation as insurer of deposits, receiver, and liquidator of troubled banks; the role of the Comptroller of the Currency as the primary federal regulator of national banks, including the chartering function, bank examinations, analysis of classified loans, capital adequacy, and enforcement of substantive federal legislation; operation of the Federal Reserve System under the Bank Holding Company Act and the various substantive regulations such as Reg. B (equal credit opportunity), Reg. J (check collection), Reg. M (consumer leasing), Reg. Q (deposit rate regulation), Reg. O (insider loan limits), Reg. E (electronic funds transfer), and Reg. Z (truth in lending); geographic deregulation and the trend toward interstate banking; and an analysis of financial services product deregulation and unification of the industry along functional lines. (Examination) (Fall—day)

334 **Business Planning** (2) Green, Flyer, Berkeley, Press, Cohen,
(Formerly Law 424) Parker, Seligman, Block, Cirulnik
Integrated study of corporate, financial, tax, accounting, and SEC aspects of the following: organization of a small corporation; organization of a public corporation; stock dividends, recapitalization, and stock purchases in the context of conflict between active stockholders of a closed corporation and the family of a deceased active stockholder; corporate liquidations; corporate mergers and acquisitions; and divisions of corporations. Prerequisite: Law 327 and 420; Law 424 (Berkeley, Press). Prerequisite or concurrent registration: Law 424 (Flyer, Cirulnik). Enrollment may be limited by the professor. Berkeley, Press, Flyer, Cirulnik—(Problem Assignments); Green, Block, Seligman, Cohen, Parker—(Examination) (Fall and spring—day and evening; summer 1985)

336 **Seminar: The Modern Corporation** (2) Solomon
(Formerly Law 317)
Analysis of the nature and role of the business corporation in the American and transnational political economy; evolution of the corporation and the political economy; impact of technological change on the corporation and the political economy; reasons for and consequences of the growth of large corporate enterprises; role of entrepreneurs in the political economy; relationship of corporations to the government and other centers of power. (Research Paper) (Fall—day)

338 **Labor Law** (3) Merrifield, Rothschild, St. Antoine
(Formerly Law 341)
Law governing labor–management relations, organizations and representation of employees, regulation of economic weapons, enforcement of collective bargaining agreements, interunion and intra-union relations. (Examination) (Fall—day and evening; spring—day)

340 **Collective Bargaining and Labor Arbitration** (3) Merrifield, Rothschild, Seibel
(Formerly Law 339)
Collective labor agreement: content, negotiation, administration through grievance procedure and arbitration; problems in settlement of labor disputes. Prerequisite: Law 338. Merrifield, Rothschild—(Problem Assignments) (Fall—day; spring—day and evening)

341 Seminar: Labor Law (2) Merrifield, St. Antoine
(Formerly Law 447)
Group study of contemporary problems of labor law. Prerequisite: Law 30
(Research Paper) (Fall and spring—day)

342 Administrative Law (3) Park, Banzhaf, Barron
(Formerly Law 372) T. Schwartz, Raven-Hansen, J. Schwartz
Study of the administrative process in executive and independent regulatory agencies; emphasis on judicial review. Formal and informal decision-making, investigation, planning, and public administration functions of the agencies as related to their legal limits and to the roles of lawyers in government and private practice. Relationships of agencies to the executive and legislative branches, to public and private interest groups, and to the social, political, and economic aspects of various philosophies of government regulation. Park and Banzhaf—(Examination) (Fall—day; spring—day and evening)

344 Administrative Law Seminar (2) Raven-Hansen
(Formerly Law 401)
Group study of specific problems in administrative law. Topics will vary. In the fall 1985 semester, the course will focus on the Executive Branch. Prerequisite: Law 342. (Research Paper) (Fall—day)

345 Regulated Industries (2) Park, Schechter
(Formerly Law 414)
Substantive problems of business regulation in terms of natural monopolies, licensed industries, subsidized industries, and safety regulation. Typical problems raised include the role of intervenors, the impact of regulation upon management and market behavior, the uses and abuses of economic evidence, the role of agencies' staffs, interagency planning and regulation, and the effects of judicial and legislative review. Each student selects one industry and develops an insight into economic regulation in terms of that industry's firms, market structure, growth and development, trade associations, and regulatory agencies. (Research Paper)

347 Seminar: Law of Congress and the Presidency (2) Dienes, Raven-Hansen
(Formerly Law 381)
A seminar study of the law governing the powers and relations of Congress and the Presidency and attendant separation of powers questions, including executive confidentiality and the congressional need for information, the President's legislative role, presidential accountability, executive law enforcement, supervision within the executive branch, executive appointments and removals, the President's supervision of foreign policy, and the constitutional allocation of war powers. Intensive preparation is required, and students are expected to prepare and present one analytic paper and two critiques of papers by others. Enrollment limited. (Research Paper)

350 Seminar: Constitutional Law (2) Cheh, Dienes, Nolan
(Formerly Law 592)
Group study of contemporary problems in constitutional law; process of constitutional litigation; problems of effectuating constitutional guarantees. Limited enrollment. (Research Paper or Examination) (Spring—day and evening)

352 Public Policy and Mass Media (2) Barron, Plesser, Hammer
(Formerly Law 413)
Institutional structure of mass media and their interrelationships; psychological aspects of mass communications; continuing adjustments among public interest goals, the economic system, and technological developments; influence of and controls exercised by government, other institutions, and private groups; conflict between freedom of speech of the media and other major community interests; the media's relationships to the interests of dissident and minority groups and the access of these groups to the media. (Examination or Research Paper) (Fall—day; spring—evening)

358 **Individual Rights and Liberties (3)** Dienes, Park
(Formerly Law 587)
Principles of equality and due process in the Fifth and Fourteenth Amendments. The power of Congress to enforce the Fourteenth Amendment. Focus on individual rights and liberties under the U.S. Constitution. First Amendment rights, particularly religion and speech clauses. The right of association. Other personal rights in the Bill of Rights. Methodology of judges in deciding cases involving individual rights and liberties, particularly the "balancing test" and the judges' views of societal interests. Prerequisite: Law 212. Park (Examination); Dienes (Research Paper or Examination) (Fall and spring—day)

360 **Immigration Law (2)** Boswell
(Formerly Law 586)
Law and practice under the McCarran–Walter Act, involving questions of immigration, emigration, expatriation, nationality, and naturalization. Consular, Immigration and Naturalization Service, and Labor Department practice. (Examination) (Fall—day)

362 **Legislation (2)** Zenoff, Clark
(Formerly Law 377)
Legislative process and roles of participants in the process; operation of United States Congress and state legislatures, including fact finding, organization, procedure. Statutory interpretations emphasized to provide foundation for more advanced courses. (Examination) (Spring—day)

364 **Current Decisions (1 or 2 per semester)**
(Formerly Law 321–22)
Limited to members of the student staff of the *Law Review*. A maximum of 4 semester hours of credit may be earned in this course. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Academic year—day and evening)

366 **Journal of International Law (1 or 2 per semester)**
(Formerly Law 323)
Limited to editors of the student staff of the *Journal of International Law and Economics*. A maximum of 4 semester hours of credit may be earned in this course. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—as arranged)

370 **Sales and Sales Financing (2)** Rothschild, Zubrow, Carroll, Clark
(Formerly Law 313)
Provisions of the Uniform Commercial Code relating to sale and distribution of goods, including bulk transfers, warehouse receipts, bills of lading, and other documents of title; particular attention to secured transactions and financing devices utilized in this connection. (Examination) (Fall—day and evening; spring—day; summer 1985)

372 **Commercial Paper, Check Collection, and Banking (2)** Rothschild, Zubrow, Carroll, Clark
(Formerly Law 314)
Classic view of negotiable instruments as codified by Article III of the Uniform Commercial Code. Check collection: the system in theory as expressed in Article IV of the Uniform Commercial Code and the system in practice; Federal Reserve regulations, Clearing House agreements, and automation systems. The dual banking system, work of the Comptroller General and the Federal Reserve Board. Legal problems concerning interest and the checkless society. (Examination) (Fall and spring—day and evening)

378 **Creditors' and Debtors' Rights (3)** Cheh, Zubrow
(Formerly Law 318)
Creditors' remedies and debtors' protections under state law: writs of attachment garnishment and execution, acquisition of liens and forced sales of property, self-help arrangements, and security agreements. Bankruptcy under federal law: who may file, the creation and administration of the bankruptcy estate powers of the trustee, discharge of debt; rehabilitation plans for individuals under Chapter 13. (Examination) (Fall—day; spring—day and evening)

380 Remedies (3) Cibinic, Nash, Lowther, Park, Zubrow, Trangsr... Sharp
(Formerly Law 375)
Development and use of judicial remedies that give relief for past or threatened injuries to interests of personalty and property. Remedial approaches incl... compensatory and punitive damages, injunctions, unjust enrichment, c... structive trusts, equitable liens, tracing, subrogation, and specific reparat... Emphasis on comparing remedial options in fraud, mistake, duress, breac... contract, and abuse of fiduciary relationships. The grade *CR* (Credit) or *NC* (... Credit) only is given in sections taught by Lowther. Cibinic, Sharpe—(Examina... tion); Lowther, Nash—(Problem Assignments) (Fall—day; spring—day or evening)

382 Insurance (2) Schiller, Pro...
(Formerly Law 347)
A primary risk-distributing medium and the rules by which legislative, adminis... trative, and judicial bodies seek to promote its benefits and avert its dangers. Insurance marketing, insurable interest, subrogation, transfer of insurance benefits to nonpolicyholders, coverage and other insurance policy provisions, disposition of claims. (Examination) (Fall—day and evening, summer 1986)

386 Admiralty (3) Sharp...
(Formerly Law 302)
American practice and jurisdiction in admiralty; saving clause actions at law. Substantive maritime law of title and possession, maritime liens, personal injury and wrongful death, charter parties and bills of lading, general average and salvage and marine insurance, collisions. Lawmaking methods: judge-made law, statutes, international commercial custom, and treaties. (Examina... tion) (Spring—day)

390–91 Trusts and Estates I–II (3) Weaver, Chandler, Solomon, Sim...
(Formerly Law 325–26)
Noncommercial transfers of wealth at death or during life. Law 390: essentia... elements and formalities for creation of trusts and execution of wills, revocation and alteration, grounds for contest, limits on property owner's power to control, intestate succession. Law 391: dispositive provisions, common quest... tions of construction, future interests problems, administration of estates and trusts, charitable trusts. Prerequisite to Law 390: Law 211; to Law 391: Law 390. (Examination and Problem Assignments) (Law 390: fall—day and evening; spring—day; Law 391: spring—evening)

394 Community Property/Marital Property (2) Weaver...
(Formerly Law 349)
Legal rules and planning considerations with respect to property owned and acquired by married persons. Primary emphasis will be on the law of the eight community property states, but special attention will also be given to the parallel problems seen under the now widely enacted statutes creating judicial power to decree an equitable distribution of a divorcing couple's marital property. As time permits, federal tax rules and considerations will also be discussed. (Research Paper or Examination) (Fall—evening)

395 Seminar: Estate Planning (2 or 3) Weaver, McCoy, Solomon, Blake
(Formerly Law 553)
Study of the effective disposition of wealth by inter vivos gift and testamentary transfer; emphasis on income, estate, and gift tax considerations; use of the trust form in the transfer of wealth; use of insurance and jointly held property as part of the estate plan; planning for the continuation or disposition of the client's business interests. Preparation of an estate plan with supporting documents is the major project for the course. Prerequisite: Law 390, 391, 420, and 422. Enrollment limited by the instructors. Solomon, Weaver—(Problem Assignments); McCoy—(Choice of Problem Assignments or Research Paper) (Fall—evening)

398 Modern Real Estate Transactions (3) Brown, Schiller
(Formerly Law 327)
Advanced problems in purchase and sale of real estate: legal responsibility and

functions of buyer, seller, broker, escrow agent, conveyancing attorney, title examiner, abstractor, insuror of title; process of examination and assurance of title and other interests in realty, including recording, registration and title insurance systems, settlements and closings, warranties, hazard insurance; emerging problems related to cooperatives, condominiums, and property-owners' associations; problems related to compliance with subdivision, zoning, building and housing code regulations. (Examination) (Spring—day; summer 1985)

402 **Land Use Control (2)** Kaufman
(Formerly Law 328)
Selected problems in urban and regional planning: applications of zoning, urban renewal, and special programs available for the implementation of development plans. Enrollment limited by the instructor. (Writing Assignments and Examination) (Spring—evening)

403 **Seminar: Current Problems in Land Use Controls (2)** Brown, Schiller
(Formerly Law 504)
New and emerging concepts of regionalism considered in the light of actual problem situations and attempts being made by various echelons of government to provide effective and equitable land use management and control. Examination of actual problem areas of major concern, including constitutional, administrative, political, judicial, social, economic, and technological elements. Functional planning and decision-making with respect to selected problem areas and their strategical and tactical transactions within the compass of the broader policy considerations involved. Guest lecturers; clinical exposure to a number of appropriate government agencies. (Research Paper) (Spring—day)

408 **Land Development Law (3)** Brown
(Simulation course)
(Formerly Law 501)
Study of the basic public and private means used by society to manage and control land use, such as zoning, subdivision regulation, pending codes, eminent domain, and privately contracted conditions, covenants, and restrictions. Identification and analysis of emerging new land control processes and the roles played by public and private entities involved in or affected by land use management and control efforts at the various echelons of government. Students participate in a game-simulation process representing a specific complex situation in land use conflicts involving their inherent technological, social, economic, political, and legal elements. In the model situation, students will assume roles as attorneys and work with assigned "clients." Client-oriented written work and class participation. Enrollment limited by the instructor. (Fall—day; summer 1985)

410 **Environmental Law I (3)** Reitze
(Formerly Law 508)
An introductory course focusing on the statutes administered by the Environmental Protection Agency. Topics covered include water pollution, hazardous material control, air pollution, noise, and radiation. (Examination) (Fall—day)

411 **Environmental Law II (3)** Reitze
(Formerly Law 509)
An in-depth analysis of the Clean Air Act, focusing on legal problems common to environmental law. Topics covered include standard setting, technology-based controls, development of pollution control plans, monitoring, inspection, enforcement, economic controls, energy trade-offs. (Examination) (Spring—evening)

414 **Clinical Studies in Environmental Law (2, 3, or 4)** Reitze
(Formerly Law 516)
The student works on a project in the environmental law field under the supervision of both the faculty director of the program and a lawyer practicing environmental law. The project may involve working with a government agency,

a Congressional committee, a private practitioner, or a nonprofit public-interest environmental organization. Admission to the course requires second-semester second-year, third-year, or graduate standing and permission of the Director of the Environmental Law Program. Students who have mastered the fundamentals of environmental law are selected for this course. Normally this will require completion of at least Law 410. Students may repeat the course for a maximum of 8 semester hours of credit. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. Five hours of work per week are required for each credit. (Fall and spring—day)

415 Occupational Safety and Health Legislation (OSHA) (2) Savelson, Reitz

(Formerly Law 451)

A review of the history of safety and health law in the United States and an analysis of the interrelationships of various federal and state safety and health laws. The focal point will be the Occupational Safety and Health Act of 1970. By use of commission and court decisions the course will survey the jurisdictional applicability of the Act and the responsibilities imposed thereunder: analysis of enforcement and adjudicative procedures. (Examination) (Fall—evening; spring—day)

420 Taxation—Federal Income (3) Weaver, Solomon, Sims, Block, Whitner Hoffman

(Formerly Law 336)

Survey of substantive provisions of federal income tax law, including concept of gross income, provisions affecting taxation of family and individual transactions, limitations on allowable deductions, sales and dispositions of property, problems of capital gains taxation, nontaxable exchanges. Weaver—(Examination and Problem Assignments) (Fall and spring—day and evening)

422 Taxation—Federal Estate and Gift (2 or 3) Weaver

(Formerly Law 338)

Survey of substantive provisions of federal estate and gift tax laws, including inter vivos transfers, transfers in contemplation of death, joint interests, life insurance proceeds, property subject to powers of appointment, marital deduction, and split gifts; tax procedure. (Examination) (Spring—day)

424 Taxation—Federal Income, Corporations and Shareholders (3) Solomon, Sims, Block

(Formerly Law 340)

Continuation of Law 420. Primary emphasis on corporate–shareholder relationships. Problems of corporate dividends, redemptions of stock, distributions in partial and complete liquidation, stock dividends, bail-outs, and dividends in kind. Federal income tax problems involved in the formation of corporations, the sale of corporate businesses (including collapsible corporations), mergers and acquisitions, and corporate divisions. Prerequisite: Law 420. (Examination) (Fall—day; spring—evening)

426 Taxation—Partnerships and Subchapter S (2) Weaver, Sanders, Block

(Formerly Law 551)

Income tax problems of partnerships and tax-option corporations (Subchapters K and S of the Internal Revenue Code of 1954). Practice-oriented study of partnerships, including syndication, organization, and structure of entity, with emphasis on policy examination of areas of IRS principal concern, including tax shelters, disproportionate tax allocations, retroactive allocations, guaranteed payments to partners, contributions of capital, basis for gain or loss, non recourse financing, "at-risk" rules, current and liquidating distributions, sale of partnership interests, collapsible partnerships, "like-kind" exchanges, termination, special basis adjustments, and distributions to retiring or deceased partners. Planning-oriented analysis of Subchapter S, including procedures for electing and terminating Subchapter S status, treatment of income and losses, limitations on deductibility of losses, and how to avoid pitfalls. (Examination) (Fall—day; spring—evening)

428 **Seminar: Special Problems of Tax Policy** (2) Sims
(Formerly Law 564)
Intensive study of selected aspects of the tax structure with primary attention given to the federal income tax. Problem areas are reviewed primarily from the standpoint of tax policy, including legal, economic, social, and practical considerations. Alternative solutions, including current legislative proposals, are examined. Prerequisite: Law 420, 424. (Research Paper) (Fall—day)

434 **Domestic Relations** (2) Potts, Zenoff
(Formerly Law 348)
Marriage, annulment, and divorce; adoption and custody of children; economic relations. (Examination) (Fall—evening; spring—day; summer 1985)

436 **The Child, the Family, and the State** (2) Zenoff
(Formerly Law 487)
The rights of children, particularly in the family and criminal law area, are the focus of this course. Among the subjects covered are child custody, support, medical treatment, neglect, status offenders, and delinquency. (Examination)

437 **Seminar: Law and Psychiatry** (2) Zenoff
(Formerly Law 486)
Designed to expose the lawyer to basic constructs of psychiatry and psychology and to explore their implications in legal rules and practice. Psychiatrists and psychologists actively involved in teaching process. Topics include psychological testing and other assessment techniques, psychiatric evaluations and reports, child custody and other family law issues, privilege and confidentiality, competency in civil and criminal contexts, criminal law matters (including criminal responsibility and dispositional issues), civil commitment, right to treatment, right to refuse treatment, experimental procedures, and informed consent. Problems of counseling, legal ethics, preparation for trial, direct and cross examination, and other aspects of practice considered. There is ordinarily at least one session in a mental institution. (Choice of Research Paper or Examination) (Spring—day)

438 **Comparative Law** (3) Brand
(Formerly Law 307)
Introduction to comparative method and analysis, basic features of civil law systems, sources, legal profession, judicial organization, constitutional issues. Selected issues of contemporary and practical interest, such as domestic relations, inheritance, contracts, torts, consumer protection. Emphasis on the intimate relationship between comparative law and conflict of laws; description of methods of conflict avoidance and problems attendant upon transnational litigation. (Examination) (Spring—day)

440 **Conflict of Laws** (3) Seidelson, Pock, Lowther, Steinhardt
(Formerly Law 309)
Legal problems arising from occurrences transcending state or national boundaries; jurisdiction; foreign judgments; constitutional influences; theoretical bases of choice of law principles and their application to specific fields, including torts, contracts, property, family law, administration of estates, business associations. The grade *CR* (Credit) or *NC* (No Credit) only is given in sections taught by Lowther. Lowther—(Problem Assignments); Seidelson, Pock, Steinhardt—(Examination) (Fall and spring—day and evening)

442 **Jurisprudence** (2) Park, Chandler, Cheh, Steinhardt, Nolan
(Formerly Law 335)
Basic jurisprudential concepts: nature of law; development of legal institutions; jurisprudential schools—natural law, analytical, historical, sociological, functional; law and logic, law and justice, the judicial process, legislative, executive, administrative decision-making, impact of politics, economics, and scientific advance on legal systems, contemporary trends in jurisprudential thought. Park, Cheh, Nolan, Steinhardt—(Examination); Chandler—(Research Paper) (Fall—day and evening)

443 U.S. Foreign Relations Law (2) Chandler, Jo
(Formerly Law 534)
Seminar involving the study of foreign relations law. Materials to be read
discussed relate to the Constitutional and other public law problems that a
in the development and conduct of U.S. foreign relations. (Research Pap
(Spring—evening)

444 International Law and World Order (3) Mallison, Steinhardt, Zed
(Formerly Law 303)
An introduction to international law that provides the background for speci
ized seminars. Emphasis on national states as participants in decision-ma
processes, with consideration of public bodies and other participants; analy
of range of available sanctions; roles and effects of international agreem
under the U.S. Constitution; introductory study of humanitarian law; introd
tory study of the World Bank. Complements but does not repeat material
Law 447. (Examination) (Fall—day and evening; spring—day; summer 198

445 Introduction to International Economic Law (2) Jone
(Formerly Law 426)
An introductory survey of U.S. trade law, the international trade law system and
involved organizations, U.S. trade policy and its formulation, the interaction
domestic political developments on U.S. international trade law and policy an
its administration, an introduction to international investment issues, and th
international monetary system. Emphasis will be on trade and its interactio
with other topics considered. (Examination) (Fall and spring—day)

446 Legal Aspects of International Business Transactions (2) Jone
(Formerly Law 427)
U.S. law and practice relating to the formation and dissolution of internation
business agreements; brief treatment of other common and civil law system
multinational codes, and multilateral agreements; U.S. and developing countr
regulation of foreign investment; concession, licensing, distributorship, and
financial agreements; sources of finance, transnational reach of U.S. legislatio
including taxation, antitrust, foreign payments; protection of foreign inves
ment, exhaustion of local remedies and espousal; nationalization of inves
ments; sovereign immunity; litigation in a transnational setting, includin
choice of law and forum, jurisdiction, discovery, enforcement; arbitration
Occasional guest lecturers. Emphasis on current problems (Examina
tion) (Spring—evening)

447 United Nations Law and World Order (2) Mallison
(Formerly Law 304)
Introduction to international law through study of law and practice of United
Nations Charter; structure and process of decision of United Nations; mainte
nance of international peace and security—peaceful settlement of disputes and
national and collective self-defense; current problems considered by the
General Assembly and Security Council and recent decisions of the Internation
al Court of Justice. Complements but does not repeat the material in Law 444
(Examination) (Spring—day and evening)

448 Seminar: International Law (2) Jones
(Formerly Law 370)
Survey of arbitration in international commercial, financial, and governmenta
transactions. Analysis of the arbitration agreement, the process of arbitration
and the enforcement of arbitral awards. Review of the various arbitral tribunals
and their rules. (Research Paper) (Fall—day)

450 Unfair Trade Practices (3) Weston, Banzhaf, Schwartz, Schechte
(Formerly Law 329)
Unfair trade practices at common law and under modern legislation; privileges
to enter markets and compete; interference with contractual relationships;
trademarks and trade names; imitation of product appearance; misappropria
tion of ideas and trade secrets; right of publicity; basic copyright principles;
protection of competitors and consumers against false advertising and unfair c

deceptive practices under Federal Trade Commission Act, Trademark Act, and state unfair trade and consumer protection statutes; price and service discrimination under Robinson-Patman Act and state legislation. (Examination) (Fall—day and evening)

452 **Federal Antitrust Laws (3)** Weston, Schechter

(Formerly Law 330)

Federal antitrust law and policy under the Sherman, Clayton, and FTC Acts; basic economic theory of free-market operation; the Rule of Reason and *per se* offenses; price fixing, market division and related agreements under Sherman Act §1; conspiracies; boycotts; trade association activities; measurement of industrial concentration; monopolization and attempts to monopolize under Sherman Act §2; mergers and joint ventures under Sherman and Clayton Acts; resale price maintenance and other vertical restraints; exclusive dealing and tie-in agreements under the Clayton and Sherman Acts; selected exemptions from antitrust liability. (Examination) (Fall—day; spring—day and evening)

454 **Product Liability (2)** T. Schwartz

(Formerly Law 331)

Development of the concept of product liability and consumer's remedies. Specific problems and processes in evaluation of risk and benefit encountered in government regulation of dangerous and defective products. Survey of civil actions for harm resulting from defective and dangerous products with reference to parties and proof in negligence, warranty, nuisance, fraud, misrepresentation, and other cases. Problems associated with hazard identification, insurance, and industry self-regulation. Review of Consumer Product Safety Act and current legislation dealing with injuries and remedies in specific areas. (Choice of Research Paper or Examination) (Spring—day)

460 **Problems of the Consumer (arr.)** Rothschild and Staff

(Formerly Law 395)

(1) *Consumer Protection Center*—Clinical treatment of consumer protection. Students engage in one or more of a number of the Center's projects. For example, "Consumer 9" is a project that solves problems received in writing or by telephone for a nightly television show. "Consumer H-E-L-P" places students in telephone contact with inner-city consumers. The cluster intern program places law students with the District of Columbia Office of Consumer Protection. The Center's federal programs allow students to gain experience in regulatory agencies. Students may also write and publish in the *Consumer Protection Reporting Service*. Minimum of 8 hours work commitment each week, 2-hour weekly seminars required in addition for 3 credits. May be repeated once for a total credit not to exceed 6 hours. (Medine)

(2) *Bankruptcy Clinic*—Open to second- and third-year students. Students participate in negotiations with creditors, counsel clients in financial matters through intensive interviews, and prepare legal petitions in bankruptcy that may be necessary to assist clients. May be taken for 2 or 3 credits. One and one-half hour weekly seminar. (Davis)

The grade *CR* (Credit) or *NC* (No Credit) is given for both sections of this course. (Fall, spring, and summer—day)

462 **Seminar: Trade Regulation (2)** Weston, Bodner

(Formerly Law 417)

Group study of current problems relating to unfair trade practices and federal antitrust laws. (Research Paper) (Spring—day)

464 **Patent Law (2)** Kayton, Miller

(Formerly Law 359)

Law of patents subsequent to issuance of patent; nature of patent as property and as a legal instrument; validity—novelty, nonobviousness, utility and enablement; infringement, doctrine of equivalents, and file-wrapper estoppel. Designed for students intending to specialize in patent law; knowledge or experience in patent law helpful but not prerequisite. (Examination) (Fall—evening)

466 Patent Office Practice (2)
(Formerly Law 362)
Substantive and procedural law of patents leading to issuance of patent, m
related to proceedings before U.S. Patent Office. Obtaining and pres
earliest possible patent filing date; continuing applications, res judicata, ra
and nonobviousness requirements; substantive rules of priority of inve
and related affidavit practice; nature of claims and formal defects; de
patenting. Designed for students intending to specialize in patent law. Pre
uisite: Law 464. (Examination) (Spring—evening)

468 Computers and the Law (3) Chand
(Formerly Law 585)
A critical study of selected major legal problems presented by comp
technology: including the impact upon legal doctrine and legal institut
Jurimetrics, the theory of various uses that are and may be made of compu
in legal research, the practice of law, and court administration will
examined. Familiarity with the rudiments of computer science or programm
would be helpful, but is not required. (Examination) (Spring—evening)

469 Seminar: Law of Privacy (2)
(Formerly Law 589)
A review of the law of privacy as it has developed in constitutional litigation
law, and state and federal statutes. Current developments and rationales
further expansions of privacy rights are considered. (Research Paper)

470 Medicine for Lawyers (2)
(Formerly Law 389)
Survey of the basic medical sciences and the rudiments of clinical medicine
encountered in the practice of law. Medical terminology, the disease proces
trauma, and industrial medicine. The application of this fundamental info
tion is demonstrated in personal injury or negligence and malpractice litigat
as well as in commitment and equitable proceedings. Emphasis on enabling
lawyer to communicate most effectively with medical specialists. (Examinat
(Fall and spring—day)

472 Law and Medicine (2) Sharpe, Fisch
(Formerly Law 390)
Malpractice, insurance, and alternatives to professional liability litigatio
securing and presenting medical evidence to prove causation and damage
chemical test data and behavioral science findings in court; entry into m
practice of the professions; professional organizations; hospitals; professio
service delivery; public policy intervention in medical science—for example
abortion, transplantation, and coerced treatment. (Examination) (Fall—day)

474 Seminar: Drugs and the Law (2) Sirulnik, Meyer
(Formerly Law 481)
A study of federal and state laws controlling illicit drugs, including the historica
evolution of these laws; current offenses and penalties; constitutional limits on
the criminal sanction, enforcement practices, and sentencing considerations.
Alternative models for controlling drugs, including decriminalization and
legalization. Five class sessions will be devoted to mock criminal trials at which
student teams conduct direct and cross examination of guest expert witnesses
in the field. Graded on the basis of assigned memoranda pertaining to the legal
issues involved in the mock hearings. (Writing Assignments) (Spring—day)

475 Seminar: Law, Science, and Technology (2) Green
(Formerly Law 492)
Reciprocal relationships between law and science: absorption of scientific
concepts into substantive law through adjudication, legislation and rule-
making techniques and procedures used in handling, developing, and decidin
scientific issues. (Research Paper) (Spring—day)

478 Law and Criminology I: Search for the Causes of Criminal Behavior (2) Courtless
(Formerly Law 475)
The role that criminological knowledge of crime causation may play in assisting

lawyers to appraise the effectiveness of various alternative social and legal devices in controlling deviant behavior. The search for factors related to criminal behavior will be developed historically, with emphasis on current causal theories developed by various disciplines. Model as well as operational penal codes, sentencing and probation practices, and specialized facilities will be analyzed in terms of their relationship to such causal theories. (Research Paper) (Spring—day)

479 **Law and Criminology II: Society's Responses to the Criminal Offender** (2) — Courtless

(Formerly Law 476)

Study of the development and current use of society's three major approaches to the handling of offenders: punitive, mechanical, and correctional. Emphasis on society's changing responses to criminal and delinquent behavior; research findings concerning effectiveness of these responses. Analysis of treatment strategies to facilitate communication between members of the legal profession and behavior scientists charged with effectuating these strategies. Prerequisite: Law 478. (Research Paper)

480 **The Police and the Community** (2) — Courtless

(Formerly Law 477)

Problems and potential of contemporary urban law enforcement; the role and perspective of the police officer; the police *qua* organization; styles of law enforcement; law enforcement in the inner city; relationship with ethnic minorities; civil disorder; police–community relations; methods in arrest and investigation; complaint review procedures; science and technology in law enforcement; police handling of juveniles; crime and crime statistics. (Problem Assignments) (Fall—day)

482 **Disabled People and the Law** (2) — Banzhaf

Formerly Law 397.

Examination of those areas in which persons with disabilities have traditionally been denied some right or benefit afforded other persons in our society and have resorted to legal action; introduction to statutes and agencies designed to protect people with disabilities. Students may choose to prepare a research paper (and receive legal writing credit and a numerical grade) or to gain practical experience doing a clinical project (on a *CR/NC* basis). (Spring—day)

483 **National Center for Law and the Deaf Clinical Education Activities** (1, 2, or 3) — Banzhaf

Formerly Law 398.

Work with the National Center for Law and the Deaf in bringing legal information, services, and representation to the more than 13 million Americans who are deaf or hearing-impaired. The Center is designed to help make the hearing-impaired aware of their legal rights and to assist them in solving their legal and law-related problems. Students may participate in one or more projects: (1) counseling persons with hearing impairments about legal problems at a walk-in clinic usually held on the Gallaudet College campus; (2) preparing and participating in workshops for hearing-impaired persons to acquaint them with their rights and obligations under the law; (3) assisting in representing the interests of deaf and hearing-impaired persons in judicial and administrative proceedings; (4) preparing research papers on topics related to law and the deaf or preparing handbooks explaining legal topics to the hearing impaired. Students may learn some sign language but will be assisted by trained translators when dealing with deaf individuals. Approximately 60 hours of work per semester is required for each credit hour. Students may repeat this course for a maximum of 8 semester hours of credit. This course may not be taken at the same time as Law 495 or any litigating activities in Law 493. The grade of *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, summer—as arranged)

484 **Women and the Law** (2) — Ridder

(Formerly Law 394)

An examination of the treatment of women in all areas of the law and legal

remedies for sex discrimination. Emphasis on constitutional law, crimina
discrimination in the media, education, and employment. Students ch
clinical projects or research papers on which to focus the semester's wo
Enrollment limited to 30 students. (Research Paper) (Spring—day)

486 Government Contracts (3) Nash, Cib
(Formerly Law 355)
Survey of basic law underlying government procurement, basic power
limitations on federal government in entering into contracts, administrative
legislative policies governing these contracts, advertised and negotiated pr
curement procedures, forms of contracts and clauses used. Law 487, *Gov*
ment Procurement Law, is the substantial equivalent of this course (Exam
tion and Problem Assignments) (Spring—day)

487 Government Procurement Law (4) Nash, Cibinic, Le
(Formerly Law 431)
Survey of the law pertaining to government procurement, including an analy
of the unique features of government contracting and a discussion of th
functions of Congress, the executive branch, and the courts in the procureme
process. The course focuses on the contract formation process, includi
techniques for awarding contracts and litigation and protests involving award
Law 486 is the substantial equivalent of this course. (Examination and Proble
Assignments) (Fall—evening)

488 Performance of Government Contracts (4) Nash, Cibinic, Le
(Formerly Law 432)
Discussion of the substantive problems that most frequently arise during th
performance of government contracts. Interpretation of specifications and th
most generally used contract clauses; analysis of the rights of the parties whe
performance in accordance with the terms of the contract is not obtained
Analysis of the methods that can be used by the parties to a governmen
contract to obtain legal relief, including detailed coverage of the dispute
procedure, actions for breach of contract, and forms of equitable and extraordi
nary relief. (Examination and Problem Assignments) (Spring—evening)

489 Seminar: Government Contracts (2) Bednar, Nash
(Formerly Law 435)
Research and discussion of selected problem areas. (Research Pape
(Spring—day) Staf

492 Clinical Law Work (arr.)
(Formerly Law 399)
Projects involving litigation, research, or public interest activities of a legal
nature (including aid to indigents, support of public interest nonprofit corpo
tions, and support of governmental agencies or courts) may be initiated and wi
be supervised by a faculty member. Projects must be approved in advance by
the Law Center Supervisory Committee (three members) both as to whether the
project is appropriate and as to the number of semester hours of credit to b
granted. A maximum of 10 semester hours of credit may be taken in one or two
semesters. This course is open to a limited number of third-year law students
The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and
spring)

493 Legal Aid (arr.) Sirulnik and Staf
(Formerly Law 346)
(1) *Civil Administrative Law Clinic*—Working under the supervision of staf
attorneys, students represent indigent litigants before state and federal admin
istrative agencies. Activities include Social Security Disability hearings, Rental
Accommodations Office hearings, Unemployment and Worker's Compensation
hearings, Food Stamp reviews, will writing, and other public benefits program
work. Ten hours work per week required. Two-hour weekly seminar and
additional weekly meeting with supervisor. Permission of the instructor re
quired prior to registration. (Del Giudice)

(2) *Immigration Clinic*—Clinical work includes representation of clients at
deportation hearings, and oral argument before the Immigration and Natura

ization Service, Board of Immigration Appeals, and the U.S. Court of Appeals. Students will assist aliens residing in the Washington area with a wide variety of problems, including adjustment from nonimmigrant to immigrant status, obtaining labor certifications and work visas, obtaining visas for their relatives in other countries to enter the United States, and obtaining voluntary departure orders for those whose visas have expired and who are threatened with deportation. Ten hours work per week required. Two-hour weekly seminar and additional weekly meeting with supervisor. Permission of the instructor prior to registration. Prerequisite or concurrent registration: Law 360. (Boswell)

(3) *Outside Clinical Placement*—Students arrange independent projects with state or federal public interest organizations for academic credit. A compilation of suggested projects is available within the Community Legal Clinics office. Projects must receive prior approval by the Director of Clinical Programs or the staff. (Barthel)

(4) *Small Business Clinic*—Under guidance of the instructor, students assist small businesses and nonprofit organizations, dealing with a wide variety of problems, including drafting partnership and incorporation papers, drafting and reviewing contracts and commercial leases, advising on tax problems, and resolving disputes. Prerequisite: Law 327 and 420. Permission of the instructor required prior to registration. (Aron)

The grade *CR* (Credit) or *NC* (No Credit) is given for all sections of this course. (Fall, spring, summer)

495 **Law Students in Court** (4) Carter

(*Formerly Law 345*)

A clinical program in trial advocacy, offering an opportunity to develop skills as a trial lawyer while representing indigent persons in the Superior Court of the District of Columbia. Students may participate in either the civil division (which focuses primarily upon the representation of tenants in landlord–tenant actions, but also handles some consumer, negligence, and other civil matters) or the criminal division (in which student litigators defend persons charged with misdemeanor offenses). Students in both divisions have the opportunity for jury trials. They are responsible for all aspects of litigation under the supervision of clinical instructors: interviewing clients and witnesses, conducting investigations, preparing pleadings, engaging in settlement negotiations or plea bargaining, and conducting all motions hearings and trials pursuant to the Superior Court's third-year practice rule. Only third-year students who have completed Law 218, 215, and 232 may participate in the clinic. Seminars are held in the civil division on Monday evenings and in the criminal division on Wednesday evenings. Students must have one day per week available for court appearances and plan to devote approximately 20 hours per week to the clinic. Students must participate in the program for two consecutive semesters, beginning in either the summer or fall. Application must be made during the spring semester of the preceding academic year. This course may not be taken at the same time as Law 497 or any litigating activities in Law 493. Enrollment is limited with selection by lottery. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, and summer)

496 **Law Students Civil Rights Research Council (LSCRRC)** (2, 3, or 4) Sirulnik and Staff

(*Formerly Law 343*)

Clinical problems concerned with the legal problems of minorities, women, and the poor. Students work with organizations such as the Lawyers Committee for Civil Rights Under Law, Women's Legal Defense Fund, Civil Rights Division of the Justice Department, Institute for the Development of Indian Law, National Committee Against Discrimination in Housing, and National Senior Citizens Law Center. Approximately 60 hours of work per semester are required for each credit hour. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. Permission of the instructor is required prior to registration. (Fall, spring, summer)

497 Clinical Studies in Urban Law (arr.) Sirulnik and St

(Formerly Law 579)

(1) *Civil Litigation Clinic*—Open to third-year students. Students repres indigent litigants in the Small Claims, Family, Landlord–Tenant, and Ci Divisions of the D.C. Superior Court. Work responsibilities include int interviewing, investigation, settlement negotiations, preparation and argume of motions, as well as conducting actual trials. Two-hour weekly semin (Strand, Barthel)

(2) *Federal Appellate Clinic*—Open to third-year students. Students parti pate in preparing actual cases on appeal, starting with review of trial transc and culminating with preparation of brief and oral argument before U.S. C of Appeals for the District of Columbia Circuit. Appellate practice and pro dure studied through texts; consultation with appellate judges, law clerk and attorneys with cases pending on appeal; observation of arguments in th Supreme Court and the Court of Appeals. Two-hour weekly seminar. (Giudice)

(3) *Consumer Litigation Clinic*—Open to third-year students. Students repre sent indigent consumers in the Small Claims and Civil Divisions of the Di Superior Court and U.S. District Court and represent consumers in administra tive proceedings before the D.C. Department of Consumer and Regulatory Affairs. Students assume full case responsibility from the initial interview through trial. Two-hour weekly seminar. (Medine)

For all sections, admission is by permission of instructor; students must submit applications during spring term of preceding year. Must be taken for credit hours per term for the entire academic year or for 2 credit hours carried over both summer sessions. (Fall, spring, summer)

498 Legal Activism (2 or 3) Banzha

(Formerly Law 396)

Study of the legal process, not to benefit individual clients, but as a powerful tool for affecting social change and advancing the public interest. Topics discussed in a 2-hour seminar meeting each week include principles of maximizing legal leverage, legal judo, guerrilla law, working with the press and members of Congress, drafting of legal documents, unusual legal tools and tactics, negotiation, making money from public interest law, etc. Students may choose to bring a public interest legal action before an agency or in court or may undertake another legal action project for 3 credits and receive a numerical grade. Alternatively, students may do research on a topic related to public interest law for 2 credits on a *CR/NC* basis. (Fall—day

CLINICAL LEGAL STUDIES

Director: E.S. Sirulnik

Faculty Advisers: D.P. Rothschild, E.S. Sirulnik, J. Banzhaf III, A.W. Reitze

Related Courses

496 *Law Students Civil Rights Research Council (LSCRRC)*
495 *Law Students in Court*
493 *Legal Aid*
460 *Problems of the Consumer*
498 *Legal Activism*
483 *National Center for Law and the Deaf*
492 *Clinical Law Work*
545 *Environmental Litigation*
414 *Clinical Studies in Environmental Law*
497 *Clinical Studies in Urban Law*
596 *Graduate Clinical Studies*

500 Practical Economics for Lawyers (2) Rubin
(Formerly Law 415)
For students with no prior economics training. No calculus or statistics is required. Key principles of economic theory are presented, with focus on the application of these principles to antitrust, regulatory impact analysis (including environmental cost/benefit analysis), utility ratemaking and regulation, and deregulation. The course also considers preparation and examination of economic expert witnesses in these areas of the law. (Examination) (Spring—evening)

501 Public Economic Policy and the Law (2) Peterson
(Formerly Law 403)
Interrelation of law and economics in such subject-matter categories and decisional contexts as economic regulation of industry, fiscal policy planning, government research and development practices, foreign trade and investment, and public spending priorities. (Research Paper) (Spring—evening)

505 U.S. Regulation of International Trade (2) Johnston
(Formerly Law 542)
Study of theory and practical application of United States laws, regulations, and governmental infrastructure affecting international trade. Public international forums and agreements influencing U.S. regulation, e.g., GATT, the MTN, UNCTAD and treaties of friendship, commerce, and navigation; constitutional basis for U.S. government regulation of international trade; exemplary areas of trade regulation: Export Administration Act, foreign assets control, tax, Foreign Corrupt Practices Act, Arab boycott regulations, antitrust, countervailing duties, import relief for domestic industries, East–West trade, generalized system of preferences, and tariff nomenclature. (Examination) (Spring—evening)

507 Regulation of Investment Advisers and Investment Companies (2) Brown
Formerly Law 580)
Applicability of the Investment Company Act of 1940 to particular business activities that may bring an entity within the statutory definition of investment company; litigation as to fees; policy considerations relating to front-end loads; SEC regulations regarding advertising and promotion, restrictions on activities by affiliates; and current SEC disclosure requirements. Applicability of the Investment Advisers Act of 1940 to activities of individuals and entities; procedures for compliance; First Amendment issues raised by SEC enforcement actions; and civil liability under the antifraud provisions of the securities laws. (Examination) (Spring—evening)

508 Seminar: Health Care Delivery Systems (2) Tillman
Formerly Law 408)
Study of the role of the lawyer in existing and proposed national systems for delivering health care. Students will gain familiarity with the concepts and terms in health care delivery by working with issues in the design, finance, and administration of existing arrangements, examination of the means of reconciling the expectations of various groups of health care service consumers and providers. (Research Paper) (Spring—evening)

509 Food and Drug Law (2) Kaplan, Becker
(Formerly Law 412)
The Federal Food, Drug, and Cosmetic Act and related laws. Consumer, government, and industry viewpoints. (Choice of Research Paper or Examination) (Spring—evening)

510 Administrative Practices and Procedures (Food and Drug Administration) (2) Rothschild, Horton
Formerly Law 411)
The study of FDA administrative procedures for the purpose of investigating the significance that administrative practice has on regulatory activity. The course will consider FDA rulemaking procedures in general, a step-by-step consideration of the various hearing procedures now available under the new agency

practices and procedures, and problems designed to enable the ... application of rulemaking and hearing procedures to achieve res... Prerequisite: Law 342. (Examination) (Fall—evening)

518 Seminar: Comparative Labor Law (2) Merr...
(Formerly Law 440)
A comparison of different systems for the regulation of labor and indu... relations in selected countries. Group study of how common problem... handled under these systems. Topics may include legal status of coll... agreements, worker participation in decision-making, limits on barga... weapons, procedures for settlement of grievances and jurisdictional d... protection against unfair dismissal, and reconciliation of individual, mi... and majority group interests. Prerequisite: Law 338 or equivalent. Res... Paper)

520 Labor Standards (2) Gins...
(Formerly Law 442)
Analysis of the Fair Labor Standards Act, its scope and exemptions; the... Rights Act and other labor statutes; the laws establishing labor standards... government contracts, including the Davis–Bacon Act, Walsh–Healey... Service Contract Act, and Work Hours Act; the role of the Department of L... the Comptroller General, and the contracting agencies in interpretation... administration, and enforcement of these statutes. (Examination) Spring... evening)

521 Labor Relations in the Federal Service (2) Tobe...
(Formerly Law 443)
Study of the Civil Service Reform Act, with emphasis on the structure and ... law developed by the Federal Labor Relations Authority, Federal Se... Impasses Panel, and Merit Systems Protection Board. Parallels are dra... between federal sector, non-federal public sector, and private sector devel... (Research Paper) (Fall—evening)

522 Internal Union Affairs (2) Osborne, Wit...
(Formerly Law 444)
Study of the legal relations between unions and their members with spe... emphasis on the right to fair representation, the right to union membership... compulsory union membership, the imposition of discipline upon unio... members, reporting requirements, the conduct of internal union elections, ... fiduciary duties of union officers, the imposition of trusteeships, the regulati... of racketeering, and political action of unions. Prerequisite: Law 338. Examina... tion) (Fall—evening)

523 National Labor Relations Board Procedures (2) DuRoss...
(Formerly Law 445)
A survey of the National Labor Relations Board's unfair labor practice proce... dures. The course is designed to provide a broad exposure to all aspects of the... National Labor Relations Board's practice, including a survey of the remedies... and the particular procedures used to secure remedies. Prerequisite: a basic... labor law course. (Research Paper) (Fall—evening)

524 Equal Employment Opportunity (2) Morris...
(Formerly Law 446)
This course covers the spectrum of federal laws and executive orders relating to... all types of discrimination in employment, including Title VII of the Civil Rights... Act of 1964, as amended by the Equal Employment Opportunity Act of 1972; the... Equal Pay Act of 1963, as amended in 1972; the Age Discrimination in... Employment Act; the Civil Rights Act of 1866; the Fourteenth Amendment; the... National Labor Relations Act; Executive Orders 11246 and 11375 relating to... government contractors (including the "Philadelphia Plan" and other govern... ment-imposed "affirmative action" plans and bid conditions, and Revised Order... No. 4 relating to sex discrimination). Substantive and procedural rights available...

to employees of firms doing business with the government, as well as those of other private firms and state and local government agencies subject to the above federal legislation. (Examination) (Fall—evening)

526 **Seminar: Labor Litigation (2)** Driesen
(Formerly Law 448)
Examination of the Supreme Court's work in the labor law field, with emphasis on current and recently decided cases. Facets of Supreme Court practice and procedure that bear upon labor litigation; litigation strategies and objectives of institutions and practitioners who practice labor law before the Supreme Court. Each student will study intensively the labor relations opinions of an individual Justice, followed by participation in a mock conference of the Justices on a pending or recent case and preparation of a paper analyzing the Justice's views on important labor law issues. Prerequisite: Law 338. (Research Paper) (Spring—evening)

527 **Equal Employment Claims and Litigation (2)** Morris
(Formerly Law 450)
Litigation in federal court of a claim of employment discrimination; problems faced by attorneys for both plaintiff and defendant; practice in drafting pleadings that the attorneys for the parties would prepare in litigating a claim of employment discrimination. (Problem Assignments) (Spring—evening)

529 **Seminar: Public-Sector Labor Law (2)** Nassau
(Formerly Law 452)
Group study of contemporary problems of labor law. The course is devoted exclusively to problems of the public sector. (Research Paper) (Spring—evening)

532 **The Crime Lab, the Forensic Scientist, and the Criminal Lawyer (2)** Starrs, Melson
(Formerly Law 473)
Designed to acquaint the student with the operations of a modern crime laboratory and the courtroom acceptability of testimony of forensic scientists and other evidence on laboratory test results. Identification of individuals (fingerprints, palmprints, footprints, voiceprints, anthropological reconstruction, hair identification, and serology), identification of objects (ballistics, handwriting, typewriting, fiber identification, paints, varnishes, glass, wood, and paper), toxicology, pathology, forensic use of the microscope and the camera, the coroner and the medical examiner systems, and drug law enforcement. Visual aids, crime laboratory guest lecturers, and field trips to crime laboratories. (Research Paper) (Fall—evening; spring—day)

534 **Seminar: Criminal Practice (2)**
(Formerly Law 479)
Tactical and practical applications of criminal law; mastery of techniques in trying criminal cases. Class sessions built around mock problems based on actual criminal cases; student role-playing as defense attorneys and prosecutors. All phases of criminal trial work are covered—client relations, investigation, discovery, trial preparation; particular emphasis on courtroom techniques—direct and cross examination, impeachment, refreshing recollection, laying foundations for exhibits, argument, and courtroom demeanor. Though many of the mock problems are written from a defense viewpoint, techniques taught are relevant to both prosecution and defense. Enrollment limited to 15 third-year and graduate students. Prerequisite: Law 305. Students may elect to receive either a numerical grade or the grade *CR* (Credit) or *NC* (No Credit).

535 **Law of Criminal Corrections (2)** Cripe
(Formerly Law 480)
Study of two principal areas: sentencing procedures (including probation, parole, and imprisonment) and legal rights of prisoners. Enrollment limited to 25 students. (Examination) (Fall—evening)

538 Banking Institutions and Their Role in Real Estate Investments (2) Schaumber, Solon
(Formerly Law 502)
History of the American banking system; review of the Federal Reserve Sy... and Federal bank regulatory agencies; regulation of traditional banking ac... ties; examination of the Bank Holding Company Act; history of savings and ... associations; restrictions and expanding scope of branch banking; mergers ... acquisitions; role of each institution in financing real estate acquisitions ... development. (Examination) (Spring—evening)

539 Survey of Mortgage Finance (2) Fruss...
(Formerly Law 503)
Overview of mortgage finance and the secondary mortgage market, inclu... the origins, financing, and operations of major government-sponsored ... cies, the legal and regulatory framework, economic function, mortgage pric... the role of mortgage-backed securities, and expansion of the private mar... (Examination) (Fall—evening)

541 Intergovernmental Relations I (2) Va...
(Formerly Law 505)
Study of federalism, emphasizing current techniques for achieving cooperat... and coordination between federal, state, and local governments. Detailed ... consideration of devices used, including interstate compacts, grants-in-aid, ... exercise of regulatory powers. (Research Paper) (Fall—day) Ni...

542 Intergovernmental Relations II (2)
(Formerly Law 506)
Advanced seminar on multi-government activities and current topics ... intergovernmental relations. (Research Paper)

543 Water Resources Law (2) Hedem...
(Formerly Law 510)
Federal and state powers over water, riparian and prior appropriation doc... trines, Indian and reserved rights, groundwater law. Federal programs for wate... resources development, federal permit programs. Wetland protection and ... coastal zone management. Recommended as an introductory course. (Exami... nation) (Fall—evening)

544 Environmental Planning (2) Kus...
(Formerly Law 511)
Administrative law issues, the National Environmental Policy Act, histor... preservation, parkland protection, coastal zone management, river basin and ... floodplain planning, comprehensive transportation planning, state environ... mental planning laws, mitigation requirements. (Research Paper) (Spring—... evening)

545 Environmental Litigation (2)
(Formerly Law 513)
Special problems of environmental lawsuits. Topics include pleadings, proce... dural problems, selection of the proper court, problems of proof, remedies, ... selection of parties, discovery techniques, obtaining temporary restraining ... orders and preliminary injunctions, trial preparation, and use of expert ... witnesses and scientific evidence. Prerequisite: third-year or graduate status. ... Recommended for students who have taken at least one environmental law ... course. Enrollment limited to 35 students. (Writing Assignments) Kirby

546 Natural Resources Law (2)
(Formerly Law 514)
Introduction to federal public lands and their multiple uses: forestry, grazing, ... water, mining, fish and wildlife, recreation, and preservation. Principles of ... Congressional and state authority over these lands. Endangered Species Act, ... and wildlife refuges. The Wilderness Act and the National Park System. Class ... focus on topical case studies and statutory materials. Recommended as an ... introductory course. (Examination) (Fall—evening)

547 **Pollution Control Law** (2) **Buente**
(Formerly Law 515)
A detailed analysis of federal regulation of water pollution, hazardous waste, and toxic substances. Intensive examination of sewage construction grants process and toxic effluent controls under the Clean Water Act and hazardous waste handling, disposal, and clean-up under the Resource Conservation and Recovery Act and the Comprehensive Environmental Response, Compensation, and Liability Act. Other statutes covered include the Toxic Substances Control Act, Safe Drinking Water Act, and Federal Insecticide, Fungicide, and Rodenticide Act. Recommended for third-year and graduate students. Prerequisite: Law 410. Law 543 and 342 (or another basic administrative law course) are recommended prior to taking this course. (Examination) (Spring—evening)

548 **Control of Toxic and Hazardous Substances** (2) **Hedeman, Friedman, Harvey**
(Formerly Law 517)
Analysis of the federal and state laws and regulatory schemes relating to the control of toxic and hazardous substances. Federal laws to be examined include the Toxic Substances Control Act, the Resource Conservation and Recovery Act, the Federal Insecticide, Fungicide, and Rodenticide Act, and the Comprehensive Environmental Response, Compensation, and Liability Act ("Superfund"). Common law as it relates to toxic control; administrative and institutional problems associated with the control of toxic and hazardous substances. (Research Paper) (Spring—evening)

549 **Energy** (2) **Hollis**
(Formerly Law 512)
Survey of federal regulation of the major energy industries. Emphasis on federal controls affecting the natural gas, coal, oil, synthetic fuel, and electric industries. The course approaches energy regulation from a statutory and case standpoint and also deals with practical, procedural issues. Enrollment is limited to 35 students. Recommended for third-year students. (Examination) (Fall—evening)

550 **Use and Control of Nuclear Energy** (2) **Malsch**
(Formerly Law 518)
Analysis of the legal framework for regulation of nuclear energy in the United States and for dealing with proliferation of nuclear weapons abroad. Discussion of substantive technical and policy issues relating to nuclear power reactor safety, disposal of radioactive waste, and safeguarding nuclear installations against domestic nuclear terrorism. Focus of the legal discussion is on the U.S. Nuclear Regulatory Commission. Includes such topics as Federal preemption, impact of the National Environmental Policy Act of 1969, conduct of adjudicatory hearings under the Administrative Procedure Act, compensation for injuries from nuclear accidents, and prelicensing antitrust reviews. (Research Paper) (Spring—evening)

552 **Patent and Know-how Licensing** (2) **Brunsvold**
(Formerly Law 522)
The business and legal criteria necessary to implement and maintain successful licensing programs; emphasis on the strategy and techniques that permit a proprietor of intellectual property to effectively exploit his or her status as the owner of a unique form of property. Subject areas covered are business objectives in licensing; legal outline of licensing situations; rights and duties of license parties; factors in selecting which inventions to license—financial, legal, and commercial; finding and selecting the right licensees; determining and negotiating the terms and clauses of the contract; administering and enforcing the license; antitrust and misuse constraints on the business and law of licensing; tax factors affecting the patent and know-how contract; special problems in trade secret, know-how, and show-how contracts; international licensing. Prerequisite: Law 464. (Choice of Research Paper or Examination) (Spring, odd years—evening)

553 Chemical Patent Practice (2)
(Formerly Law 524)
Seminar covering patent application preparation, prosecution, appeals ... interferences peculiar to chemical patent practice. Prerequisite: Law 464, 466, or comparable experience in the practice of patent law. (Examination) (Fall, even years—evening)

554 Advanced Topics in Patent Law (2)
(Formerly Law 527)
Seminar directed to selected, advanced, and usually topical aspects of pa... law. Topics may include the Re-examination Statute of 1981, procedu... patent infringement appeals to the U.S. Court of Appeals for the Federal Cir... patent and copyright protection of living microorganism and genetic... engineered sequences, fraud in patent practices, and advanced aspects ... practice before the U.S. Patent and Trademark Office, including inter... interference practice. This course may be repeated for credit. Prerequisite: ... 464 and 466. (Research Paper) (Fall, even years—evening)

555 Research in Patent, Trademark, and Copyright Law (2)
(Formerly Law 529)
Prerequisite: Law 464, 466, and related courses. Request in writing, ... proposed outline of topic of research, must be submitted to the instructo... least one month prior to registration day. Work must be completed within ... semester and paper submitted not later than the last day of classes. Gradu... students may repeat this course once for credit with the approval of the Di... (Research Paper) (Fall and spring)

558 International and Comparative Patent Law (2)
(Formerly Law 521)
Origin of patent laws. Patent systems of major countries—United Kingd... France, Germany, USSR, and others. Comparative topical survey: kinds ... patents, inventors and applicants, subject matter, novelty, administrative pr... dures, oppositions, revocation, renewal fees, compulsory licensing, infri... ment, etc. International Convention for the Protection of Industrial Prop... origin, membership, organization, substantive provisions. Treaties in the ... ing. Common Market patent system. Nordic Patent. Patent Cooperation T... Council of Europe activities. Prerequisite: Law 464 and 466. (Examination) ... (Spring, even years—evening)

559 Copyright Law (3)
(Formerly Law 525)
Historical background; formalities and essentials in securing a copyri... subject matter of copyright, remedies; international aspects of copyright: ... Berne Union, Universal Copyright Convention, Inter-American Conventi... copyright licensing and performing rights societies. (Examination) (Spring ... evening

560 U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks (2)
(Formerly Law 526)
Procedural and substantive law on use, registration, and protection of tra... marks, including detailed registration procedure in the U.S. Patent and Tra... mark Office, common law rights to marks, and licensing and franchise ... arrangements. (Examination) (Fall, odd years—evening)

563 Negotiation: Concepts and Techniques (2) Ramundo Tarr...
(Formerly Law 535)
Roles of the attorney–negotiator and principal (client) in the private, intragov... izational, and international negotiating environments; the "think negotiati... mentality and a suggested conceptualized approach to the negotiation proc... including the definition of negotiation, four phases of negotiation, and ... tional checklists; negotiating techniques, including presentational conv... ations and the use of persuasion, tactics and ploys, and classic do's and d... lists; theories of the opening position and concession-making. Practical e...

cises in the actual conducting of negotiations. Enrollment limited by the instructors. (Writing Assignments) (Spring—evening; summer 1985)

565 **The International Law of Human Rights** (2) Fruchterman
(Formerly Law 537)
Development of the rights of man from Grotius through the American and French Revolutions to the work of the United Nations in the field of human rights: the individual vis-à-vis the State; the regional approach to international protection of human rights, with emphasis on the European Convention; the inter-American, African, and Socialist approaches; human rights in armed conflict; and terrorism as a basic deprivation of human rights. (Research Paper) (Fall—evening)

566 **International Law of Air and Space** (2) Steinhardt
(Formerly Law 531)
Study of the development of international law related to the use of air space and outer space: analysis of air and space treaties in force; the role of various intergovernmental and nongovernmental international organizations; consideration of special problems such as liability resulting from space activities, space technology and arms control, and pollution and contamination of outer space; earth resources, sensing, etc. Enrollment limited to 25 students. (Research Paper) (Fall—evening)

567 **International Law of the Sea** (2) Doyle
(Formerly Law 532)
International law affecting allocation of authority over ocean space. Development of international law concerning territorial sea, contiguous zone, high seas, continental shelf, and deep seabed. Current legal and policy issues associated with these areas. (Examination) (Spring—evening)

568 **International Humanitarian Law of Coercion Control** (2) Mallison
(Formerly Law 533)
Process of legal decision concerning international conflicts and civil wars, including the protection of war victims, control of international terrorism, problems concerning weapons of mass destruction, war crimes and punishment, and problems of preserving human and material values by transforming coercion situations to minimum order ones. Consideration will be given to the four Geneva Conventions of 1949 for the Protection of War Victims, the Geneva Protocols of 1977, the role of the International Committee of the Red Cross, and current problems in the application of humanitarian law. (Research Paper) (Spring—day)

569 **Soviet Law** (2) Ramundo
(Formerly Law 546)
Concept of "socialist legality"; legal relationship of individual to state and other participants in Soviet society; role of Party in Soviet legal system; Soviet philosophy of law; state (constitutional) law: Soviet federalism, governmental apparatus, rights and obligations of citizenship; criminal law; property law; labor law; selected topics in civil law and procedure; international law. (Research Paper or Examination) (Fall—evening)

570 **Chinese Law** (2) Hsia
(Formerly Law 547)
Emphasis on the legal system of China; analysis of the constitutional law of China, including general principles, state structure, and rights and duties of citizens; a brief survey of the administration of justice—courts, procuratorates, and lawyers; marriage law; land law; counter-revolutionary act and other criminal statutes; principles of civil law; Chinese concept of international law. (Research Paper) (Fall—evening)

571 **Law of the Near East** (2) Jabri
(Formerly Law 548)
Law of the Arab countries, Turkey, and Iran, including basic principles of Islamic law, analysis of the present day codes, and investigation of Western influences on laws of these countries. (Research Paper)

573 Accounting Aspects of Federal Income Taxation (2) Ha
(Formerly Law 550)
Problems involved in assigning items of income and deduction to the pr
taxable year. General implications of timing differences, annual accou
periods, methods of accounting (particularly the cash method and the ac
method), constructive receipt and the cash equivalency doctrine, transac
problems (including the tax benefit rule and claim of right doctrine
installment method of reporting gain, cost recovery (including deprecia
and changes in accounting periods and methods. Net operating losses
inventory accounting may also be considered. While this course entails s
coverage of widely used accounting methods, it is directed principal
accounting aspects of federal taxation. Students interested primarily in ac
ing a familiarity with financial accounting precepts should instead take
324, *Law and Accounting*. Prerequisite: Law 420 or its equivalent (Exam
tion) (Spring—evening)

577 Taxation—Special Corporation Problems (2) Di
(Formerly Law 555)
Detailed study of the principal federal tax benefits of the corporate form
doing business. Consideration of problems involved in the tax planning of
corporate structure and corporate operation, including the tax definition
corporation, the special deductions available to corporate payers, the comp
sation of the corporate executive and employee, the debt–equity question,
accumulated earnings tax, the personal holding company tax, multiple co
rations, and consolidated returns. Survey of the types of corporations recei
special treatment under the Internal Revenue Code, such as financial insti
tions, real estate investment trusts, regulated investment companies, coop
tives, and small business corporations. Prerequisite: Law 424. (Research Pa
or Examination) (Spring—evening)

578 Taxation—Exempt Organizations (2) Hopk
(Formerly Law 557)
Tax-exempt organizations: policy and practice of preferred tax treatment
selected organizations and gifts to them. Statutes, regulations, and IRS pract
legislative origins, judicial interpretations, and policy considerations. Tes
qualification disqualification, and limited tax preference. Mechanics of se
ing and retaining exemption; qualified exemption; unrelated business inco
private inurement, political activity. Denial or loss of exemption. Return a
reporting requirements. Comparative tax treatment of nonexempt and nonpr
it organizations. Special sanctions with respect to private foundations, manag
ers, and donors for improper, excessive, or prohibited activities. Enrollment
may be limited. Prerequisite: Law 420. (Choice of Research Paper or Examina
tion) (Fall—evening)

579 Taxation—Real Estate and Income (2) Tucker, Gottlie
(Formerly Law 558)
The effect of income taxes on the real estate market and real estate transactions
sales and exchange of real estate interests; various entities for the ownership
and development of real estate; the impact of taxes on the landlord and tenan
the impact of taxes on the mortgagor and mortgagee, including the choice of
financing techniques, such as sale-leaseback; depreciation, amortization, and
obsolescence; basis and basis adjustments; and casualties and other involunt
tary conversions. Prerequisite: Law 420. Law 424 is suggested but not required
(Examination) (Spring—evening)

580 Taxation—Oil and Gas (2)
(Formerly Law 559)
Application of federal income tax law to producing segment of oil and ga
industry. Classification of interests, treatment of exploration and developmen
expenditures. Depletion allowance and concept of economic interests. Sale
vs. leasing transactions. Organization problems. Prerequisite: Law 420
(Examination)

581 **Taxation—State and Local** (2)
(Formerly Law 560)
Taxation by state and local governments; problems of real and personal property taxation, sales and use taxes, business and personal income taxes. Limitations on taxation of interstate commerce. Congressional problems. (Choice of Research Paper or Examination) (Fall—evening)

582 **Selected Topics in Taxation—Principles of Charitable Tax Planning** (2) McCoy
(Formerly Law 561)
Intensive study of the federal income, estate, and gift tax consequences of gifts and bequeaths to charity, including limitations and conditions on deductions; uses of charitable trusts; private foundations; estate planning aspects of charitable transfers, and special charitable gift planning techniques. (Research Paper or Examination) (Fall—evening)

583 **Income Taxation of Foreign Business and Investment** (2)
(Formerly Law 562)
The provisions and policies of federal income tax law applicable to foreign income, including considerations affecting the choice of methods of engaging in foreign business and investment, treatment of controlled foreign corporations, allocation of income in foreign commerce, credit for foreign taxes, principles and trends of U.S. tax treaties. (Examination)

584 **Taxation—Capital Gains and Losses** (2) Levine
(Formerly Law 563)
An in-depth study of the federal income tax consequences relating to the sale, exchange, or other disposition of property, including stock and securities, real estate, machinery and equipment, commodities, foreign currency, patents and copyrights, contracts, goodwill and going-concern value, franchises, and other tangible and intangible property. While the primary concern is the distinction between, and effect of, capital and ordinary gain or loss, related areas will be examined, including the alternative minimum tax, disallowance of losses, depreciation recapture, and methods of deferring recognition of gain and loss. Prerequisite: Law 420 (Examination) (Fall—evening)

586 **Taxation—Deferred Compensation I** (2) Lieber, Posner, Cohen
(Formerly Law 565)
Tax and labor law consequences of deferred compensation. Examination of new standards imposed by the Employee Retirement Security Act of 1974. Consideration of tax consequences of "unqualified" plans, lump sum distributions, individual retirement accounts, and the requirement that defined benefit plans be insured by the Pension Benefit Guaranty Corporation. Prerequisite: Law 420. (Problem Assignments and Examination) (Fall—evening)

587 **Taxation—Deferred Compensation II** (2) Lieber, Klevan, Cohen
(Formerly Law 566)
Nonqualified arrangements: constructive receipt, cash equivalent, I.R.C. §§ 83 and 404 and individual retirement accounts. Qualified plans: deductions, distributions (annuities, lump-sum distributions, rollovers, employer stock), ESOPs, termination insurance, fiduciaries and service providers (reporting, disclosure, fiduciary standards, self-dealing), estate and gift tax, unrelated business income, simplified pension plans, and master and prototype plans. Law 420 recommended but not required prior to taking this course. Neither a tax background nor Law 586 is prerequisite. (Examination) (Spring—evening)

588 **Seminar: Tax Practice and Procedure** (2) Smiley, Lauber
(Formerly Law 567)
Review of the major areas of tax practice, including organization of the Internal Revenue Service, legislation, administrative regulations, tax planning, tax rulings, tax audit, settlement procedures, claims for refund, tax collection processes, criminal tax practice, and ethical problems in tax practice. Preparation of various documents is required. Prerequisite: 5 semester hours of taxation courses, including Law 420. (Problem Assignments) (Fall—evening)

591 Legislative Drafting (2) Woodman, Sm

Advanced instruction and practice in legislative drafting; overview of legisla process with emphasis on legislative drafting. Enrollment limited to 30 s dents. (Problem Assignments) (Fall and spring—evening)

596 Graduate Clinical Studies (1, 2, 3, or 4)

Limited to LL.M. candidates. Practical experience in the student's area specialization or interest. The student may work with a government agency Congressional committee, court, or other such entity performing tasks norma assigned to an attorney. Course approval must be obtained from the student faculty adviser and/or the Dean. A maximum of four credit hours may applied toward graduation. For each credit hour, 56 hours of nonremunerative work must be performed. A written report describing in some detail the specific work performed and evaluating the experience received is required. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, summer; Staf

597 Independent Studies (ART.)

Limited to teaching fellows. The proposed program of study must be submitted to a faculty member in writing and approved prior to the beginning of the semester. May not be elected for more than 12 semester hours of credit. (Fa and spring) Staf

598 Research in Public Law (1 or 2)

Limited to graduate students with at least a *B* average who have had a seminar or comparable course in the field of proposed research. Students are responsible for obtaining an adviser from the full-time faculty who is willing to sponsor their research. This adviser's name must be submitted to the Dean at registration. Work must be completed within the semester. Students may repeat the course once for credit with the approval of the Dean. (Research Paper) (Fa spring, summer) Staf

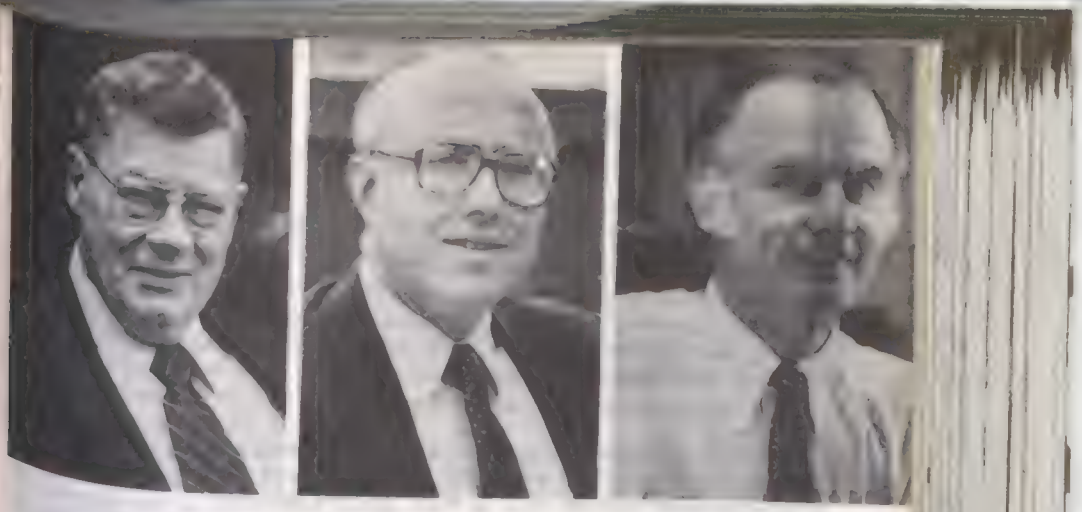
599–600 Thesis (2–2)

Students must register for two successive semesters and cannot register for both sections in one semester. (Fall, spring, summer) Staf

620–21 Legal Research and Writing (1–1)

(For Foreign Students)

Introduction to and practical experience in the use of a law library; instruction and practice in legal writing, including a memorandum and appellate court brief; instruction and experience in the preparation and argument of an appellate court case; instruction in questions of professional responsibility and ethics. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. To credit, a student must attain a minimum grade of 65. No credit will be given for this course unless it is taken both fall and spring semesters. Failure to complete the work in this course will result in a grade of 45. (Fall and spring—evening)



SPECIAL PROGRAMS IN RESEARCH AND INSTRUCTION

ADMINISTRATIVE LAW: ECONOMIC REGULATION

Faculty Advisers: R.E. Park, G.E. Weston

344 *Administrative Law Seminar*
510 *Administrative Practices and Procedures (Food and Drug Administration)*
509 *Food and Drug Law*
500 *Practical Economics for Lawyers*
501 *Public Economic Policy and the Law*
352 *Public Policy and Mass Media*
345 *Regulated Industries*
325 *Regulation of Securities Markets*
326 *Securities Aspects of Corporate Finance*
328 *Securities Regulation*
508 *Seminar: Health Care Delivery Systems*
462 *Seminar: Trade Regulation*
565 *U.S. Regulation of International Trade*

Master of Laws candidates in the area of Administrative Law: Economic Regulation who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

342 *Administrative Law*
452 *Federal Antitrust Laws*
450 *Unfair Trade Practices*

Other Related Courses

241 *Intergovernmental Relations I*
542 *Intergovernmental Relations II*
402 *Land Use Control*
556 *Use and Control of Nuclear Energy*
559 *Copyright Law*

CORPORATION LAW

Faculty Advisers: L.D. Solomon, H.P Green, J. Seligman

334 *Business Planning*
445 *Introduction to International Economic Law*
446 *Legal Aspects of International Business Transactions*
507 *Regulation of Investment Advisers and Investment Companies*
326 *Securities Aspects of Corporate Finance*
505 *U.S. Regulation of International Trade*

Master of Laws candidates in the area of Corporation Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's Program.

327 *Corporations*
452 *Federal Antitrust Laws*
370 *Sales and Sales Financing*
424 *Taxation—Federal Income, Corporations and Shareholders*
450 *Unfair Trade Practices*

Other Related Courses

487 *Government Procurement Law*
583 *Income Taxation of Foreign Business and Investment*
454 *Product Liability*
501 *Public Economic Policy and the Law*
328 *Securities Regulation*
462 *Seminar: Trade Regulation*
577 *Taxation—Special Corporation Problems*
560 *U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks*

ENVIRONMENTAL LAW PROGRAM

Director A.W. Reitze, Jr.

The Environmental Law Program consists of course work, individual research and clinical work, with the student selecting the mix that meets his or her particular need. Most courses are offered in the early evening so that they can be taken by students in both the day and evening divisions. Advanced courses are taught by some of the most experienced practitioners in the field.

The clinical program allows students to work for the government or for environmental lawyers in the private sector. Placements are usually available with the Departments of Justice, Energy, and Transportation, the Environmental Protection Agency, and private organizations such as the Environmental Defense Fund, the Natural Resources Defense Council, and the National Wildlife Association. The clinical program offers the student with very specific environmental interests a chance to develop these interests in a work setting. Thus, students with interests in topics such as wetland acquisition, historical protection or wildlife protection can take relevant course work and then further specialize through the clinical program. If the student is interested in individual research, course credit is also available for this type of study.

ENVIRONMENTAL LAW

Faculty Adviser: A.W. Reitze, Jr.

414 *Clinical Studies in Environmental Law*
548 *Control of Toxic and Hazardous Substances*
549 *Energy*
410 *Environmental Law I*
411 *Environmental Law II*
545 *Environmental Litigation*
544 *Environmental Planning*
546 *Natural Resources Law*
547 *Pollution Control Law*
550 *Use and Control of Nuclear Energy*
543 *Water Resources Law*

Individual Research

314 *Legal Writing (J.D. Candidates)*
598 *Research in Public Law (Master's Candidates)*
599–600 *Thesis*

Other Related Courses

342 *Administrative Law*
343 *Administrative Law Seminar*
386 *Admiralty*
509 *Food and Drug Law*
487 *Government Procurement Law*
566 *International Law of Air and Space*
567 *International Law of the Sea*
591 *Legislative Drafting*
398 *Modern Real Estate Transactions*
500 *Practical Economics for Lawyers*
415 *Occupational Safety and Health Legislation*
501 *Public Economic Policy and the Law*
345 *Regulated Industries*
508 *Seminar: Health Care Delivery Systems*
580 *Taxation: Oil and Gas*
581 *Taxation: State and Local*

GOVERNMENT CONTRACTS PROGRAM

Director R.C. Nash, Jr.

A comprehensive government contracts program provides continuing instruction for industry and government personnel in this field and a program of courses leading to the Master of Laws degree in Government Procurement Law. The program includes (1) short seminars, (2) one-week courses in advanced problems in the field, (3) an annual institute treating a problem of contemporary importance, (4) an annual conference in a major area, (5) compilation of materials for use in current courses, (6) publication of a series of monographs treating special problems in the field, and (7) special research projects.

GOVERNMENT PROCUREMENT LAW

Faculty Advisers: J. Cibinic, Jr., R.C. Nash, Jr.

486 *Government Contracts*
487 *Government Procurement Law*
541 *Intergovernmental Relations I*
542 *Intergovernmental Relations II*
489 *Seminar: Government Contracts*

Other Related Courses

334 *Business Planning*
340 *Collective Bargaining and Labor Arbitration*
468 *Computers and the Law*
410 *Environmental Law I*
527 *Equal Employment Claims and Litigation*
524 *Equal Employment Opportunity*
452 *Federal Antitrust Laws*
300 *Federal Jurisdiction*
541 *Intergovernmental Relations I*
338 *Labor Law*
520 *Labor Standards*
446 *Legal Aspects of International Business Transactions*
591 *Legislative Drafting*
563 *Negotiation: Concepts and Techniques*
464 *Patent Law*
424 *Taxation—Federal Income, Corporations and Shareholders*
450 *Unfair Trade Practices*
550 *Use and Control of Nuclear Energy*

INTERNATIONAL AND COMPARATIVE LAW PROGRAM

Director W.T. Mallison

The objectives of the International and Comparative Law Program are to provide insights, skills, and substantive understanding of international law and foreign legal systems. Specific objectives in international law are to provide an understanding of decision making, sanction processes, legal institutions, and the relationships between domestic and international law. Specific objectives in comparative law include understanding of the basic institutions of civil law countries, the reception of civil law and common law in non-Western countries and the role of decisional law and judicial review in selected legal systems. Improvements that are needed to promote the rule of law in the world community are also considered. International aspects of business transactions and economic development are included in the program. The specializations in public law include the humanitarian law that seeks to protect war victims in conflict situations and disaster victims in peace time and promotion of the control of violence when it cannot be eliminated. The objectives of the program are implemented through course work and seminars for both J.D. and post-J.D. degree students and through research and writing in pertinent fields.

INTERNATIONAL AND COMPARATIVE LAW

Faculty Adviser: W.T. Mallison

The basic courses for the International and Comparative Law Program are Law 444, *International Law and World Order*, and Law 447, *United Nations Law and World Order*. Either of these courses provides an important background for the following advanced seminars. Law 438, *Comparative Law*, is also recommended for background.

570 *Chinese Law*
438 *Comparative Law*
564 *Diplomatic and Consular Law and Practice*
568 *International Humanitarian Law of Coercion Control*
444 *International Law and World Order*
566 *International Law of Air and Space*
565 *International Law of Human Rights*
567 *International Law of the Sea*
571 *Law of the Near East*
569 *Soviet Law*
443 *U.S. Foreign Relations Law*
505 *U.S. Regulation of International Trade*

Master of Laws candidates in the area of International and Comparative Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's Program.

386 *Admiralty*
438 *Comparative Law*
440 *Conflicts of Laws*
444 *International Law and World Order*
447 *United Nations Law and World Order*

Other Related Courses

518 *Comparative Labor Law*
360 *Immigration Law*
583 *Income Taxation of Foreign Business and Investment*
446 *Legal Aspects of International Business Transactions*
550 *Use and Control of Nuclear Energy*

LABOR LAW

Faculty Advisers: L.S. Merrifield, D.P. Rothschild

572 *Equal Employment Claims and Litigation*
524 *Equal Employment Opportunity*
522 *Internal Union Affairs*
521 *Labor Relations in the Federal Service*
520 *Labor Standards*
523 *National Labor Relations Board Procedures*
415 *Occupational Safety and Health Legislation (OSHA)*
518 *Seminar: Comparative Labor Law*
341 *Seminar: Labor Law*
526 *Seminar: Labor Litigation*
529 *Seminar: Public-Sector Labor Law*

Master of Laws candidates in the area of Labor Law who have not taken
following courses or their equivalent as part of a Juris Doctor or Bachelor of L
program should include them in their Master's Program.

340 *Collective Bargaining and Labor Arbitration*
338 *Labor Law*

Other Related Courses

395 *Problems of the Consumer*
566 *Taxation—Deferred Compensation II*

LAND USE MANAGEMENT AND CONTROL PROGRAM

Director J.M. Brown

The social, economic, technological, political, and legal interrelationships gener
ated by the fact that land is a basic, limited-supply natural resource, capable o
being subjected to differing but concurrent public and private uses, raise
growing number of issues involving management policy and control measu
that are of critical concern to the future of the nation. The Land Use Managemen
and Control Program, through a combination of academic, clinical, and game
simulation processes, seeks to provide an understanding of existing and pendi
problems, needs, means, and opportunities for solution with respect to th
developing area of national concern.

LAND USE MANAGEMENT AND CONTROL

Faculty Advisers: J.M. Brown, L.A. Schiller, J.P. Chandler

538 *Banking Institutions and Their Role in Real Estate Investments*
408 *Land Development Law*
403 *Seminar: Current Problems in Land Use Control*
539 *Survey of Mortgage Finance*

Master of Laws candidates in the area of Land Use Management and Control wh
have not taken the following courses or their equivalent as part of a Juris Doct
or Bachelor of Laws program should include them in their Master's Program.

342 *Administrative Law*
410 *Environmental Law I*
411 *Environmental Law II*
398 *Modern Real Estate Transactions*

Other Related Courses

544 *Environmental Planning*
402 *Land Use Control*
591 *Legislative Drafting*
318 *Seminar: American Legal History*
550 *Use and Control of Nuclear Energy*
579 *Taxation—Real Estate and Income*
543 *Water Resources Law*
581 *Taxation—State and Local*

LAW AND CRIMINOLOGY

Faculty Advisers: T.F. Courtless, Jr., E. Zenoff, G.M. Caplan

532 *The Crime Lab, the Forensic Scientist, and the Criminal Lawyer*
534 *Seminar: Criminal Practice*
535 *Law of Criminal Corrections*
307 *Seminar: Administration of Criminal Justice*
478 *Law and Criminology I: Search for the Causes of Criminal Behavior*
479 *Law and Criminology II: Society's Responses to the Criminal Offender*
480 *The Police and the Community*
474 *Seminar: Drugs and the Law*
437 *Seminar: Law and Psychiatry*
475 *Seminar: Law, Science, and Technology*
436 *The Child, the Family, and the State*

Other Related Courses

472 *Law and Medicine*
591 *Legislative Drafting*
350 *Seminar: Constitutional Law*

PATENT AND INTELLECTUAL PROPERTY LAW PROGRAM

Director I. Kayton

The Patent and Intellectual Property Law Program is designed for students in the J.D. and post-J.D. degree programs whose intentions are to specialize in the practice of patent, copyright, or trademark law. An organized program has been developed to offer as complete and as integrated a collection of courses in these fields of law as possible. The program's course offerings now total 19 semester hours (12 of which are in patent law), one of the most extensive in the United States. (See the Patent and Trade Regulation Law area of specialization in the Advanced Courses section of this bulletin.) The object of the Patent and Intellectual Property Law Program is to provide the student with a concentration in this field of law at a level of specialization and maturity that can enable advancement far more rapidly than usual in this field.

PATENT AND TRADEMARK REGULATION LAW

Faculty Advisers: I. Kayton, G.E. Weston

554 *Advanced Topics in Patent Law*
555 *Chemical Patent Practice*
559 *Copyright Law*
558 *International and Comparative Patent Law*
552 *Patent and Know-how Licensing*
464 *Patent Law*
466 *Patent Office Practice*
560 *U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks*

Master of Laws candidates in the area of Patent and Trade Regulation Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's Program.

452 *Federal Antitrust Laws*
464 *Patent Law*
466 *Patent Office Practice*
450 *Unfair Trade Practices*

Other Related Courses

468 *Computers and the Law*
487 *Government Procurement Law*
469 *Seminar: Law of Privacy*
462 *Seminar: Trade Regulation*

TAXATION

Faculty Advisers: D.B. Weaver, L.D. Solomon, T.S. Sims

573 *Accounting Aspects of Federal Income Taxation*
575 *Criminal Tax Prosecutions*
583 *Income Taxation of Foreign Business and Investment*
582 *Selected Topics in Taxation—Principles of Charitable Tax Planning*
395 *Seminar: Estate Planning*
428 *Seminar: Special Problems of Tax Policy*
588 *Seminar: Tax Practice and Procedure*
584 *Taxation—Capital Gains and Losses*
586 *Taxation—Deferred Compensation I*
587 *Taxation—Deferred Compensation II*
578 *Taxation—Exempt Organizations*
580 *Taxation—Oil and Gas*
426 *Taxation—Partnerships and Subchapter S*
579 *Taxation—Real Estate and Income*
577 *Taxation—Special Corporation Problems*
581 *Taxation—State and Local*

Master of Laws candidates in the area of Taxation who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's Program.

324 *Law and Accounting*
422 *Taxation—Federal Estate and Gift*
420 *Taxation—Federal Income*
424 *Taxation—Federal Income, Corporations and Shareholders*

Other Related Courses

334 *Business Planning*
446 *Legal Aspects of International Business Transactions*
328 *Securities Regulation*

GENERAL ALUMNI ASSOCIATION

President Nancy Broyhill Dudley, B.A. in Govt. 1965

The objectives of this association are to unite the graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes, and to promote the general welfare of the University.

Eligible members are those who have enrolled in any school of the University and who have left the University in good standing, or any person who is or has been a member of the teaching, research, or administrative staff of the University, or of the Board of Trustees of the University.

The affairs of the Association are directed by a Governing Board, the majority of whose members represent the constituent alumni organizations of the University's schools and colleges.

The voluntary leadership of the Association works closely with the staff of the Alumni Relations Office in carrying out Association affairs. The Association may be contacted through the Alumni Relations Office.

THE GEORGE WASHINGTON LAW ASSOCIATION

The George Washington Law Association was founded in 1912 and has been affiliated with the General Alumni Association since 1926. Its purposes as stated in the constitution are to promote high standards of legal education, to keep the alumni of the school in close touch with one another, especially with members of their own classes, to gather and publish at intervals information as to the whereabouts and activities of these alumni, and to further the interests of the school.

Eligible members are those who have matriculated in the school or National University and have left in good standing, and any member or former member of the faculty of the school. Active members are those eligible members who are current contributors to the Law Annual Support Program of the University and life members of the George Washington Law Association.

The Association plans publication periodically of the Law Alumni Directory. Law alumni are urged to keep the Alumni Office informed of their whereabouts so that directory information can be kept up to date.

The Law Alumni Office is in the Jacob Burns Law Library, 716 Twentieth Street, N.W., Washington, D.C. 20052.

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THE UNIVERSITY

HISTORY AND ORGANIZATION

The George Washington University had its beginning in 1821 as the Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a National University in the Federal City. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "that persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half century the University's present plant has been developed in that section of the old First Ward familiarly known as Foggy Bottom, between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area contains several reminders of historic interest to the University. President Monroe who signed the Charter, lived at 2017 Eye Street. The first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for 50 years the pastor of a church at Nineteenth and Eye Streets, and Washington selected Twenty-third and E Streets as the site of the National University he had hoped to see established.

The University as it is now organized consists of Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the

professional schools, which include the National Law Center and the Schoo
Medicine and Health Sciences, Engineering and Applied Science, Education
Human Development, Government and Business Administration, and Public
International Affairs; and the Division of Continuing Education.

The George Washington University is privately endowed and is governed
self-perpetuating Board of Trustees of which the president is an ex of
member.

ACADEMIC STATUS

The George Washington University is accredited by its regional accredit
agency, the Middle States Association of Colleges and Secondary Schools
University is on the approved list of the American Association of Univers
Women and is a member of the College Entrance Examination Board.

LOCATION

The University is in downtown Washington, between Pennsylvania Avenue
19th, F, and 24th Streets, N.W. In immediately adjacent areas are the White Ho
the World Bank, the International Communication Agency, the Corcoran Gall
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Services Administration, the National Academy of Sciences, and the Kennedy
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	1st year	*2nd year*	*3rd year*	*4th year*	*Graduate*	*Other*
Day	366	345	326	.....	90	8
Evening	90	110	92	95	156	32

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COLLEGES AND SCHOOLS—DEGREE PROGRAMS

Columbian College of Arts and Sciences: Associate in Arts (A.A.), Associate in Arts in General Studies (A.A. in Gen.Std.), Associate in Science in Cartography (A.S. in Cart.), Bachelor of Arts (B.A.), Bachelor of General Studies (B.Gen.Std.), Bachelor of Music (B.Mus.), Bachelor of Science (B.S.), and Bachelor of Science in Cartography (B.S. in Cart.)

Graduate School of Arts and Sciences: Master of Arts (M.A.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (Mus.M.), Master of Science (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of Science in Forensic Science (M.S.F.S.), Master of Philosophy (M.Phil.), and Doctor of Philosophy (Ph.D.)

School of Medicine and Health Sciences: Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), and Doctor of Medicine (M.D.)

National Law Center: Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) (M.Comp.L. [Am.Prac.]), and Doctor of Juridical Science (S.J.D.)

School of Engineering and Applied Science: Bachelor of Science (Civil Engineering) (B.S.[C.E.]), Bachelor of Science (Computer Science) (B.S.[C.S.]), Bachelor of Science (Electrical Engineering) (B.S.[E.E.]), Bachelor of Science (Mechanical Engineering) (B.S.[M.E.]), Bachelor of Science (Systems Analysis and Engineering) (B.S.[S.A.&E.]), Master of Engineering Administration (M.E.A.), Master of Science (M.S.), Engineer (Engr.), Applied Scientist (App.Sc.), and Doctor of Science (D.Sc.)

School of Education and Human Development: Bachelor of Arts in Education and Human Development (B.A. in Ed.&H.D.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education and Human Development (M.A. in Ed.&H.D.), Master of Arts in Teaching (M.A.T.), Education Specialist (Ed.S.), and Doctor of Education (Ed.D.)

School of Government and Business Administration: Bachelor of Accountancy (B.Acct.), Bachelor of Business Administration (B.B.A.), Master of Accountancy (M.Acct.), Master of Association Management (M.A.M.), Master of Business Administration (M.B.A.), Master of Health Services Administration (M.H.S.A.), Master of Public Administration (M.P.A.), Master of Science in Information Systems Technology (M.S. in I.S.T.), Master of Taxation (M.T.), Master of Urban and Regional Planning (M.U.&R.P.), Post-Master's Graduate Certificate in Health Services Administration (Grad. Cert. in H.S.A.), Doctor of Business Administration (D.B.A.), and Doctor of Public Administration (D.P.A.)

School of Public and International Affairs: Bachelor of Arts (B.A.) and Master of Arts (M.A.)

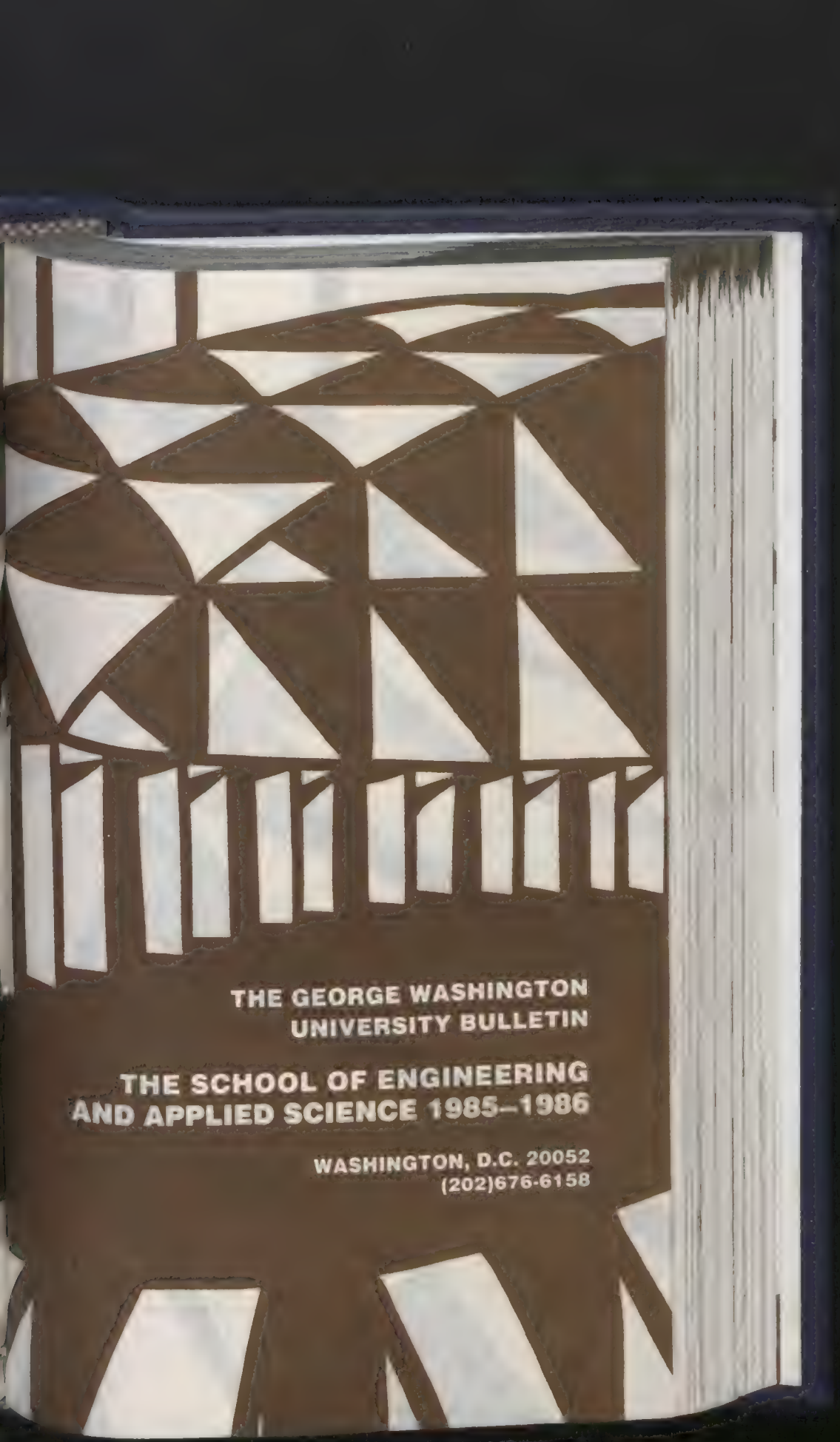

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School of Engineering and Applied Science
1985–1986

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UNIVERSITY BULLETIN

THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE 1985–1986

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Calendar 1985–1986*

1985 Fall Semester

August 26–27	Advising for all students
August 26	Orientation and placement tests begin for new students and students from foreign countries
†*August 28–30*	Registration—Tompkins Hall of Engineering Application for February graduation due as part of registration
September 2	Fall Convocation; Labor Day (holiday)
September 3	Classes begin
November 1	Application for spring semester financial aid due
November 25	D.Sc. dissertations of February candidates due
November 27	Thanksgiving recess begins after last class
December 2	Classes resume
December 3	Last day of fall semester classes
December 9–18	Examination period

1986 Spring Semester

January 3	Master's theses of February candidates due
January 6–8	Orientation and placement tests for new students and students from foreign countries Advising for all students
†*January 8–10*	Registration—Tompkins Hall of Engineering Application for May graduation due as part of registration
January 13	Spring semester classes begin
January 20	Martin Luther King Day (holiday)
February 16	Winter Convocation
February 17	George Washington's birthday observed (holiday)
March 1	Deadline for submission of 1986–87 undergraduate financial aid applications
March 3	D.Sc. dissertations of May candidates due
March 8	Spring recess begins after last class
March 17	Classes resume
April 1	Deadline for submission of summer sessions and 1986–87 graduate financial aid applications
April 14	Master's theses of May candidates due
April 18	Last day of spring semester classes
April 24–May 3	Examination period
May 4	Commencement

*The academic calendar is subject to change.
†The registration procedure and hours of registration are stated in the *Schedule of Classes*, which is available well in advance of each semester.

1985

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To All Prospective Students:

The School of Engineering and Applied Science has been in continuous session since 1884 and offers programs of study leading to bachelor's, master's, professional, and doctoral degrees. Its prime objective is to help the student develop a well-trained mind by providing optimal educational opportunities for achieving and maintaining professional competence. This includes the development of flexibility for continuing competence; the School's programs are designed to promote successful adaptation to rapidly changing technology in future careers.

This Bulletin describes the programs and requirements for undergraduate and graduate study in the School of Engineering and Applied Science and includes information on the Engineering Honor Scholarships, Cooperative Education Program in Engineering, and educational and research opportunities offered by the Joint Institute for Advancement of Flight Sciences (JIAFS), several other specialized research institutes, and the Industrial Liaison Program.

The programs of the Engineering Honor Scholarships and Fellowships have been established to recognize academically talented students who wish to study at the School of Engineering and Applied Science. The scholarships are awarded on the basis of academic merit only, and financial need is not a requirement for consideration.

The Cooperative Education Program in Engineering provides the undergraduate engineering student the opportunity to obtain an enduring foundation in engineering education by combining academic learning with practical, first-hand experience in the student's chosen field of engineering. The student's earnings may help pay for part of the cost of an engineering education.

JIAFS was created by the joint efforts of the NASA–Langley Research Center and the School of Engineering and Applied Science. The education and research opportunities offered in the program combine the academic resources of George Washington University and the professional research resources and facilities of NASA–Langley Research Center to prepare qualified graduate students for careers in research, development, design, and teaching in the flight sciences.

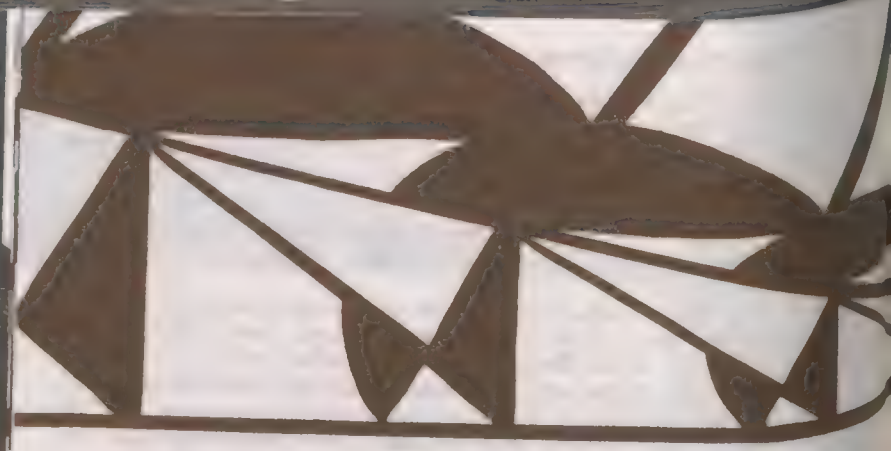
The School of Engineering and Applied Science is a professional school in a university comprised of eight degree-granting schools and colleges. The environment of the nation's capital is very favorable for the intellectual and cultural development of the student. The metropolitan Washington area contains the second largest concentration of research and development in the United States, and the engineering component of this activity is similarly extensive, offering many employment opportunities to students before and after graduation.

The atmosphere of the School is one of serious-minded effort toward mature academic development. Being a small school, it recognizes the individual as the single most important element in the educational process. The student body, undergraduate and graduate, has a primary interest in design, research, development, and management in both scientific and engineering activities. Many alumni of the School are successfully engaged in all fields of engineering—in science, management, government, and education.

The philosophy of the School, which might be summarized as "education for creativity, not conformity," has through the years reflected the many subtle and profound changes in engineering education and the engineering profession.

The faculty of the School and I look forward to a closer and more fruitful relationship with you. If you wish additional information, please do not hesitate to call upon the department chairmen or me.

Harold Liebowitz
Dean



The Study of Engineering

The Meaning of Engineering and Applied Science

The responsibilities and activities of the engineering profession extend into every aspect of industry and research and into many fields of commerce and the arts. Engineers face problems in the production and distribution of all types of manufactured products, including the design of mechanical, electrical, and chemical processes, of equipment, and of plants in which such products are made; in the design and construction of a variety of structures such as bridges, tunnels, harbors, and dams; in aircraft design and construction, including complicated electronic equipment for control, guidance, and communication; in the operation of transportation systems; in the automotive industry; in the missile and space programs; in energy resources and power and in the generation and transmission of power; in modern communication; in traffic control; in city planning; in public health and sanitation as it affects the environment; and in ventilation and refrigeration. This list of applications is far from exhaustive; it does indicate, however, that engineering is a broad profession in which there are many opportunities to specialize.

The Relationship of Engineering and Science

In any discussion of engineering and applied science, it is important to emphasize the distinction between engineering and science. The President's Scientific Advisory Committee points out that the engineer and scientist each play an important role on a team: "The scientist is one who seeks to extend the boundaries of knowledge in his chosen field. The engineer has the task of combining the knowledge of science with a knowledge and awareness of the needs and limitations of human beings and of a human society to develop and create things for human use. . . . While scientists have uncovered the basic knowledge, it is the engineers who have created the tangible tools, materials, and products that have revolutionized our daily lives, our community living, and our national defense."

The work of engineers is a focal point at which scientific knowledge, the use of such knowledge as a service to society, financial considerations, human resources, and society's needs are interrelated. The engineer is concerned, therefore, with the means for operating a dynamic society and must consider not only whether the knowledge that exists will enable the creation of a workable product but also how the product can be built, who will use it, and how such use will affect the environment in which it will operate.

The Professional Engineer

Engineers are concerned with the quality and preservation of human life. The term engineer, as used in this *Bulletin* and as commonly understood in our society, refers to the person who makes use of the advances of science and technology in an economically feasible manner for the benefit of society. This process is complex and challenging. Although the content of engineering curricula is certainly scientific, the engineer has not lost a sense of purpose in serving as an intellectual agent in the practical world. This responsibility of the engineer arises from the breadth of the implications of engineering for the whole of society as well as from the depth of the requirements for competence. Technology has radically rearranged human life in our time. There are many who believe that even though the threshold of space has been crossed, the union of medical and engineering practice has been achieved, and breakthroughs have been made in other areas, this impact of engineering on modern life is just a modest preview of the engineering of tomorrow.

Engineering Education and the Student

Rapidly changing and progressing engineering activity requires education for the future based on fundamental principles of science useful in applications to a dynamic, advanced society. In the fields of engineering and applied science, there is no substitute for demonstrated ability and competence to solve the problems faced. Without question, achievement in particular courses of study is important. Equally important, however, is the ability to analyze and interpret all aspects of a problem, to formulate solutions, and to evaluate those solutions in light of all available information. To assure that students' undergraduate education will enable them to meet these important goals, the faculty of the School of Engineering and Applied Science periodically evaluates and appraises the undergraduate program.

The curricula of the School of Engineering and Applied Science are founded on the basic principle of assisting the student in preparing for a career in engineering and applied science. This philosophy requires that the student master the principles on which future practice will be based. An education centered on that meaningful junction between theory and practice enables the engineer to follow the many interests and opportunities that may develop.

It should not be assumed, however, that only the intellectual elite should consider the study of engineering and applied science. Engineering, like medicine, law, education, science, history, government, and other disciplines, requires scholars. But in any of these areas, the prospective student who has not achieved high scholastic standing can find a place if he or she has genuine

interest in the subject. The average student who is interested and willing to work will find in engineering and applied science a rich and varied field of study that can lead to satisfaction and success. It is difficult to make generalizations in this area, but students who have demonstrated an aptitude for mathematics, science, and English will probably find the work of engineers and the study of engineering and applied science satisfying and challenging. Innate intellectual curiosity and the desire to learn and to work hard are good indicators of success. College Board examinations may reveal the capacity to undertake further study in mathematics and science and their applications to engineering. No school or college can "give" an education. It can offer only the opportunity to "get" an education. The George Washington University's School of Engineering and Applied Science provides an opportunity for close contact with faculty members as well as the opportunity to participate in student organizations and many other student activities. The School recognizes the individual as the most important element in the educational process.



THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE

History

The School of Engineering and Applied Science was organized October 1, 1884, as the Corcoran Scientific School of Columbian University and was situated in the University Building then at 15th and H Streets, N.W. The School was named in honor of William W. Corcoran, Trustee and President of the Corporation from 1869 to 1888. Day and evening courses were offered in literature, science, and technology and led to the degrees of Bachelor of Science, Civil Engineer, Mechanical Engineer, and Mining Engineer. The School was among the first to accept women for degree candidacy in engineering.

In 1903 the Corcoran Scientific School, the School of Graduate Studies, and the Columbian College were merged into a single Department of Arts and Sciences. Graduate engineering degrees were offered.

Administrative changes led to the creation of the Washington College of Engineering in 1905 as one of the several semi-independent undergraduate colleges of the University, each with its own Board of Trustees. The College provided instruction leading to undergraduate degrees in engineering and architecture.

In 1909 the name of the College was changed to the College of Engineering and Mechanic Arts, and the curricula were revised to give the student a thorough understanding of the theory underlying engineering practice. Emphasis was placed on the development of a knowledge of scientific principles upon which the student could build and by which he or she might solve new problems as they were met in practice.

The name of the School was changed again in 1914 to the College of Engineering and later to the School of Engineering. Architecture was dropped from the curriculum, and degrees were limited to the field of engineering. However, the primary emphasis upon principles rather than technology, which had characterized the School since 1903, was continued and has remained to this day as one of the important distinguishing features of the School.

In 1962 the name of the School became the School of Engineering and Applied Science.

Academic Status

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools.

The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board.

All undergraduate curricula in the School of Engineering and Applied Science are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

University Policy on Equal Opportunity

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the University, including admission to educational programs and employment. The University is subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Dr. Marianne Phelps, Associate Provost, George Washington University, Rice Hall, Washington, D.C. 20052, or to the Assistant Secretary for Civil Rights of the Department of Education.

Undergraduate Study

The undergraduate program is intended to provide a solid foundation in the basic principles, concepts, and techniques underlying engineering and applied science, on which the individual may build technical competence in a variety of areas as his or her professional career develops. It is preparation for a career in engineering or applied science as it exists today and as it may develop in the future.

Undergraduate study is the formal beginning of a lifelong continuing program of education. The School provides an environment that fosters the attitudes and disciplines essential to professional growth. Graduates, when they receive the bachelor's degree, are prepared for productive work in the chosen field and for further development and progress, both formal and informal. The undergraduate curricula include courses in the humanities and social sciences to the extent necessary to develop a reasonable understanding and appreciation of these areas of knowledge.

Admission to the engineering program indicates that the student possesses the required preparation and the probable capacity to meet the academic demands of this School. Since the School cannot predict either the student's response to the academic demands or the program to follow for the most effective development, the undergraduate program has been designed to offer a variety of experiences through which the student may find the best path to educational growth and maturity.

The School is a place for learning, for experiencing adventures of the mind and of the hand, and for the formulation, exchange, and exploration of ideas. During the undergraduate years, the student is led to strengthen skills in analysis and talent for creative activity through liberal use of project-type laboratory work. Independent thought and original ideas receive higher evaluation in the appraisal of student achievements than does rote recital of information.

To provide undergraduate engineering and computer science students with the opportunity to obtain an enduring foundation in engineering education by combining academic learning with relevant, real-world employment that provides practical, firsthand experience in engineering, the School of Engineering and Applied Science has an optional Cooperative Education Program in Engineering in which arrangements have been made with leading industrial and governmental organizations for student employment at prevailing salary rates. Every effort is made to place students in positions of employment that provide the best possible engineering experience consistent with career plans. These work periods provide students with income that may be used to finance the major portion of tuition and other expenses. Entering freshmen, as well as transfer students whose completed work is equivalent to requirements in this program, can be admitted to the Cooperative Education Program in Engineering.

Admission to Undergraduate Study

Admission is the first selective step in a series of qualifying steps the student takes in his or her progress toward professional competence in engineering or computer science. It indicates the School's belief that the applicant has at least the minimum preparation and ability to complete the curriculum successfully.

The applicant must be of good character and must have an academic background appropriate for the program of studies contemplated.

Application for Admission

An applicant for admission obtains from the Office of Admissions of the University or from the School of Engineering and Applied Science an application blank that must be filled out completely and returned with the $20 application fee. Application fee must be by check or postal money order, payable to George Washington University. The application fee is waived for a student applying for readmission who was registered in a degree program at the time of his or her last registration at this University and who has not since registered at another institution.

Incoming Freshmen

Consideration for admission is based on the following: (1) an acceptable certificate of graduation from an accredited high school showing at least 16 units;* (2) scores on the College Board's Scholastic Aptitude Test (SAT) or on the American College Test (ACT); (3) high school grades; (4) class standing.

* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 60-minute periods of prepared classroom work.

Although there are no cutoff scores per se, the tests must be taken and are considered in determining admission requirements. Students whose combined SAT scores are below 1050 (550 mathematics) must show superior academic work in their high school grades in order to be considered favorably for admission.

The principal's statement that the applicant is prepared to undertake college work may also be requested by the University.

Twelve of the 16 units required for entrance must be distributed as follows: four in English; four in mathematics, including two in algebra, one in plane geometry, one-half in trigonometry, and one-half in precalculus or analytical geometry or functions; one in physics; one in chemistry; and two in history or a foreign language. General science may not be counted in satisfaction of the science requirement but may be counted as an elective unit.

The qualifications of applicants who, because of unusual circumstances, do not meet the above requirements will be considered by the School, but additional mathematics or English placement tests may be prescribed.

An applicant must arrange to have sent directly *from his or her school to the Office of Admissions of the University* the secondary school academic record. This information must be stated on a standard form used by the secondary school, and all essential information must be included.

Quantitative Deficiency—A graduate of an approved high school who lacks not more than two units (only one of which may be a mathematics or science requirement) of the required subjects and who presents 16 acceptable units may be admitted to a prescribed program that includes courses to make up the deficiencies.

Applicants who wish to begin study in the fall semester should formulate plans early in the high school senior year. Although the University prefers to have applications submitted during the fall semester of the high school senior year, applications may be submitted until August 1. Students wishing to be considered for financial aid or on-campus housing, however, should have their applications and all required documents submitted by February 1. Students graduating at mid-term who wish to begin study in the spring semester *should* have their applications, transcripts, and other required documents submitted no later than December 15. Applications and all required credentials of students wishing to begin study in either the first or second term of the summer session must be received prior to April 15. Applications for the third summer session should be received by June 15.

Although decisions on some applications for the fall semester will require submission of seventh-term grades and senior-year College Board test scores, an earlier decision may be given after September 1 to a student whose application comes complete with a secondary school record through the junior year and junior-year test scores, provided these records clearly establish academic admissibility.

Transfer Students

Transfer students from other institutions (see page 24 for minimum residence requirement) should submit all applications and required credentials prior to August 1 for the fall semester, December 1 for the spring semester, and April 1 for the summer sessions.

The transfer student must be in good standing in regard to scholarship and conduct and should have a minimum grade-point average of 2.7 on a 4.0 scale. A student who has been suspended more than one time, has been

academically dismissed, or is currently on probation or suspension from another academic institution will not normally be considered for admission.

An applicant who has attended one or more institutions of higher learning must request *each registrar* to mail directly to the *Office of Admissions of the University* a transcript of his or her record, *even if credits were not earned.*

If an applicant has fewer than 30 semester hours of acceptable college work (C or better in academic courses from an accredited institution) at the time the application is submitted, he or she must request that the high school record and College Board SAT or ACT test scores be sent to the Office of Admissions.

Students from Foreign Institutions

Required Records

At the time the application is sent, the applicant must request the educational institutions previously attended to send directly to the Office of Admissions copies of official certificates and records listing subjects studied, grades received, examinations taken, and degrees received. Certified copies of diplomas and certificates from all secondary schools, colleges, and universities attended are required. Records of state examinations and certificates are also required. These records become the property of the University and cannot be returned.

These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies sent should be accompanied by an English translation completed by an independent agency.

Consideration will be given to academic documents delivered by the student if circumstances prohibit the receipt of official records.

Language Test

Students whose native tongue is not English are *required* to take the TOEFL (Test of English as a Foreign Language) or the ALIGU (American Language Institute, Georgetown University) test. (ALIGU tests are sometimes given overseas at U.S. embassies.) Students receiving a grade of 550 or higher on the TOEFL or 85 on the ALIGU test will not be required to take the GWU English as a Foreign Language placement test or enroll in the English for International Students program. International students abroad should consult with the nearest U.S. embassy for information on arrangements for taking the ALIGU test. Those interested in TOEFL should address inquiries to TOEFL, Educational Testing Service, Princeton, New Jersey 08541, U.S.A., well in advance of the beginning of the semester for which admission is sought. The test fee remitted with the application entitles the student to have the test score sent to three different institutions. Registration for either the TOEFL or the ALIGU test does not constitute application for admission to George Washington University.

The TOEFL *Bulletin of Information*, obtainable without charge from the Educational Testing Service (see above for address), contains a description of the test as well as rules regarding application, fees, reports, and the conduct of the test, lists of examination centers, examination dates, and an application

blank. On the application for the test, the student should specify that the scores be sent to the appropriate admissions office at this University (see Admission to Undergraduate Study, page 13, or Graduate Admission Procedure, pages 32, 38, and 40).

An admitted international student whose TOEFL score is below 550 will be required to take the GWU English as a Foreign Language placement test prior to registration. Results of this test will determine the level of English instruction (see Special English Courses for International Students, below) or other courses the student will be permitted to register for in the program of study. If the knowledge of English is inadequate to enable the student to undertake the normal academic load, the student will not be permitted to register for any courses other than English (or English plus a reduced technical load) and will be required to study English on a full-time basis. Students in this category should therefore expect to take a longer period of time to complete their graduation requirements than students who are not obliged to complete the additional English courses.

International students already in the United States may take a locally administered GWU English as a Foreign Language placement test in lieu of the TOEFL or ALIGU test. A $15 fee is charged for this examination. The test is given on a regularly scheduled basis during the week prior to registration for both the fall and spring semesters. Arrangements to take the test should be made by contacting:

Dr. Shirley M. Wright, Director
English for International Students
George Washington University
Washington, D.C. 20052
(202)676-7136

Financial Certificate

If a student plans to enter or remain in the United States to study at this University and the visa status will be either student (F) or exchange visitor (J), a Form I-20 or IAP-66 cannot be issued until the student has been admitted to the University and has completed a George Washington University Financial Certificate satisfactorily. The Financial Certificate (Form 212), required by the Office of Immigration and Naturalization, is a document that may be obtained from the School of Engineering and Applied Science. It requests information about the resources (money) available to the student to support his or her educational and living expenses while in the United States. The certificate should be accompanied by supporting documents such as bank statements or letters from governments authorizing scholarship awards.

Special English Courses for International Students

The extensive experience of the Department of English with the language needs of international students has been synthesized into a comprehensive English language program that includes the following courses.

English as a Foreign Language

15 **Intensive Basic English** (0)
Introduction of basic grammatical structures and practical vocabulary integrating speaking, listening, reading, and writing skills. Ample practice is provided in the skill areas. Course meets 15 class hours and 5 monitored

laboratory hours per week. Students registered in EFL 15 will not be permitted to register for any other academic course. Tuition is charged at the rate of 7 semester hours; laboratory fee, $60.

20 **Intensive Lower-Intermediate English** (0)
Continued basic grammar, reading, and vocabulary development; emphasis on speaking and listening skills. Course meets 17 class hours and 3 monitored laboratory hours per week. Students registered in EFL 20 will not be permitted to register for any other academic course. Tuition is charged at the rate of 7 semester hours; laboratory fee, $60.

30 **Intensive Intermediate English** (0)
Introduction of complex grammatical structures, paragraph-level writing, intensive reading, further vocabulary development, listening comprehension and note-taking practice, and conversation skills. Twenty class hours and two laboratory hours per week. Students registered in EFL 30 will not be permitted to take additional academic work unless approved by the adviser. Tuition is charged at the rate of 7 semester hours; laboratory fee, $30.

40 **Intensive Higher-Intermediate English** (0)
Comprehensive review of grammatical structures; composition focusing on outlining and techniques of exposition; strategies for analysis of unadapted reading material; oral communication skills. Twenty hours per week. Students registered in EFL 40 will not be permitted to take additional academic work unless approved by the adviser. Special-purpose sections are offered with technical emphasis. Tuition is charged at the rate of 7 semester hours.

45 **Semi-Intensive Higher-Intermediate English** (0)
Practice in composition writing; selective review of problematic grammatical structures; introduction to research techniques; development of reading, speaking, and study skills and expansion of vocabulary through use of unadapted reading materials. Ten class hours per week. Tuition is charged at the rate of 5 semester hours.

50 **English Composition/Research Methods for International Students** (3)
An advanced-level composition course for international students who demonstrate high proficiency in English. Four class hours per week. This course can be taken by international students in lieu of Engl 9 or 10. Special-purpose sections are offered with technical emphasis. Special fee, $25.

60 **Advanced Oral Communication** (3)
For international students who demonstrate high proficiency in English. Designed to develop conversational fluency through use of persuasive and informative speaking and to provide instruction in interviewing techniques and in leading and participating in group discussions. Instructional resources include contemporary topics from newspaper and magazine articles, films, interviews, and guest lectures. Meets 4 hours per week. Special fee, $25.

61 **Advanced English Language Skills** (3)
(Formerly U.S. Press and Culture, no credit)
Advanced English language skills course, involving a study of currents in American thought, culture, and civilization. Discussions based on selected texts and periodical literature. For students with scores of 45 or above on the EFL Placement Test. Meets four hours per week. Special fee, $25.

70 **Advanced Grammar Review** (0)
A comprehensive review of English grammar, designed to identify and explain features of English grammar that are troublesome to the student. Meets 5 hours per week. Tuition is charged at the rate of 3 semester hours.

The language laboratory, available to students in EFL 15, 20, and 30, contains a library of tapes that accompany the printed texts and a variety of listening and recording equipment, including individual recording and playback equipment.

Admission to a particular English as a Foreign Language class is determined by a suitable series of tests.

The English for International Students program is administered by the Division of Continuing Education and Summer Sessions and is offered in cooperation with the Department of English, Professor J.A. Quitslund, Chairman. Dr. Shirley M. Wright is the Director of the English for International Students program.

Readmission

A student previously registered in the University who was not registered on campus during the immediately preceding semester (summer session excluded) must apply for readmission. Final dates for applying are the same as those for undergraduate admission (see page 14) or graduate admission (see pages 32, 38, and 40). If a student has attended one or more higher institutions while absent from the University, the student must have complete, official transcripts sent to the appropriate office at this University from each institution attended. Applications for readmission are considered on the basis of regulations currently in effect.

The application fee is waived for a student applying for readmission who was a degree candidate at the time he or she last registered at this University and who has not since registered at another academic institution.

Advanced Standing

Credit by Examination

Assuming there is no duplication of course work earned, a maximum of 30 semester hours of credit may be assigned toward partial fulfillment of the engineering curriculum upon admission to the University for each or any combination of the following:

College Board Advanced Placement Tests (APT)—Credit is assigned for examinations passed with scores of 4 or 5 on the basis of a score report sent to the Office of Admissions from the Educational Testing Service at the student's request. The Advanced Placement Tests are administered in secondary schools in May of each year. Normally only students who complete a course designated as Advanced Placement are prepared for the examination. Arrangements for the examination are the responsibility of the applicant and should be made through the secondary school attended or with the Program Director, College Board, Advanced Placement Tests, Box 592-A, Princeton, N.J. 08541, or Box 1025, Berkeley, Calif. 94701.

College Board College-Level Examination Program (CLEP)—CLEP offers two types of examinations: General and Subject. CLEP General Examinations are offered in five areas: mathematics, social sciences, humanities, natural sciences, and English composition. CLEP Subject Examinations measure achievement in specific college-level courses and are offered in more than 47 subjects.

New Students—Upon admission to degree candidacy in the School of Engineering and Applied Science, students may be assigned undergraduate

credit for the General Examinations in the social sciences (6 semester hours) and humanities (6 semester hours) passed at the 50th percentile or above (college sophomore norms); such credit is assigned in partial fulfillment of the 18 semester hours required in the humanities and social sciences. Credit is not assigned against the engineering curriculum for CLEP General Examinations passed in the areas of mathematics, natural sciences, or English composition.

Credit is assigned for the CLEP Subject Examinations that are applicable to the School's curricula and are passed at the level recommended in the College Board model policy.

Registered Students—A candidate for a degree (i.e., a student already registered at the University before taking the CLEP Examinations) must seek departmental approval prior to taking the CLEP Examination for credit. Credit may not be earned by passing the examination after having taken the equivalent course or after having taken a waiver examination for the course.

Arrangements for the examinations are the responsibility of the applicant and should be made with the College Board College-Level Examination Program, Box 1822, Princeton, N.J. 08541.

Department Examinations for Waiver or Credit*—Registered SEAS students may also take examinations in some departments for waiver of or credit for a specific course (see Special Fees and Deposits, page 244) upon approval of the appropriate department chairman; before the test is administered, the student must have demonstrated sufficient preparation to warrant being given the test. An examination for credit is not allowed if an examination for waiver has been successfully completed or if the student has taken the course.

Make-Up of Credit for Waived Courses

If a course required by the engineering curriculum is waived, the corresponding semester hours of credit must be earned by satisfactory completion of a university-level course, either technical or nontechnical, that is approved by the student's faculty adviser or department chairman.

Waiver of the English Course Requirement

A waiver of the English course requirement in the core curriculum will be granted to those who achieve a score of 650 or higher on the English Composition Achievement Test of the College Board or a score of 58 or higher on the Test of Standard Written English (TSWE) portion of the SAT.

Credit from Institutions of Higher Learning

When no duplication is involved either through course work or examination, advanced standing may be granted for work successfully completed at accredited institutions of higher learning. Credit will be granted only when such work meets the requirements for the degree sought at this University. Work of low caliber (*D*, or the equivalent, or lower) will not be considered for transfer.

Although there is no strict limit to the total amount of transfer credit that may be assigned, a student must satisfy the residence and course requirements for the degree sought at George Washington University. Students should complete a Transfer of Credit worksheet, available in the SEAS Admissions

* This does not apply to courses offered in the Department of Electrical Engineering and Computer Science

Office, indicating their request for transfer credit and present the worksheet to their adviser for final approval.

Credit from Service Schools

A limited amount of credit may be assigned for selected service school instruction received since 1941. No more than 30 semester hours may be assigned for a combination of service school training and examinations referred to above. Veterans should submit to the Office of Admissions photostatic copies of their service school records indicating courses successfully completed, with sufficient identification of the course to locate it in the *Guide to Evaluation of Educational Experience in the Armed Forces*, which is used as a reference in determining transfer credit.

Regulations

Regulations regarding **registration, fees, and finances** are stated on pages 242–257; other University regulations, on pages 257–262

Student Status

For the purpose of defining student status, undergraduates taking 12 or more semester hours and graduates taking 9 or more semester hours are considered to be full-time students. All other students are considered to be part time.

Attendance

Students may not attend classes until registration is completed and fees due are paid or appropriate arrangements are made with the Office of Student Accounts. Students may attend only those classes for which they are registered. Regular attendance is required. Students may be dropped from any course for undue absence.

Students are expected to attend every meeting of the courses in which they are registered, fully prepared to carry on the work required. Students are held responsible for all work in their courses, including work missed because of absence. Excuses for absences from examinations that have been announced in advance can be obtained only by written application to the instructor in charge of the course.

Academic Work Load

A full-time undergraduate student who is not on probation may register for no more than 21 semester hours. A student employed more than 24 hours a week who is not on probation may take no more than 10 semester hours. In exceptional cases these limits may be exceeded with the adviser's permission. Students on probation may not register for more than 12 semester hours during the period of their probation.

Advisory System

Every entering undergraduate student is assigned a permanent faculty adviser to assist in orientation in the professional discipline. Faculty advisers counsel students on their programs of study, the achievement and maintenance of satisfactory scholastic performances, professional development, and

extracurricular activity as part of the educational process. The adviser represents the student in all cases requiring faculty action.

Students must obtain their advisers' approval of programs of study prior to registration for each academic semester and summer session. Until the work required for the degree is completed, students must consult with their adviser in all academic matters. However, an adviser may not deny entry into any course or activity to which the student is entitled under the regulations of the School.

All students are encouraged to discuss college problems with their advisers or instructors at any time, and parents or guardians are invited to consult with the dean, associate dean, department chairman, and adviser concerning any student problems. Faculty advisers counsel students to the best of the advisers' professional knowledge, but the final responsibility for a student's action lies with the student.

Placement Tests

For the guidance of the student and the adviser, beginning freshmen who have not waived English Composition 9 or 10 through their English Composition Achievement Test scores or the TSWE (see page 19) or who have not received credit for a college-level calculus course must take the placement examinations in English and mathematics. A student who is deficient in mathematics may be required to take remedial work. Results on the English placement test determine the level of the English course the student will take.

Scholarship

For scholarship requirements for graduation, see Graduation Requirements, page 24.

Grades—Grades are mailed to the student through the Office of the Registrar at the close of each semester. They are not given out by instructors.

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Unauthorized Withdrawal. The symbol *I* indicates that a satisfactory explanation has been given the instructor for the student's inability to complete the required work of the course. The symbol *Z* is assigned when a student is registered for a course that he or she did not attend and for which he or she has not done substantial work. The grade of *Z* will not be considered in determining the quality-point index.

SEAS students may not take courses required for graduation on the pass/no pass (*P*/*NP*) grading system. They may, however, take courses outside their regular engineering academic program under this grading system.

At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond the student's control, is unable to complete the work of the course and if the instructor is informed of and approves such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course that is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented to the instructor, that instructor may initiate an appropriate grade change. Although the grade of *I* may remain on the records for a maximum of one year, the

instructor should normally set a much briefer period within which the uncompleted work (usually the final examination or required paper) must be made up. The grade of *I* cannot be removed by the student's reregistering for the course here or taking its equivalent elsewhere. A grade of *I* that is not removed after one calendar year will be changed on the permanent record to a grade of *F*. A course in which a student receives an *F* in this way must normally be repeated. The grade to which the *I* is changed will be applied to the grade report for the semester or summer session during which the change is made for the purposes of determining probation, suspension, quality-point index, and Dean's and other honor lists.

All grades received by a student at George Washington University, regardless of his or her status (i.e., degree, nondegree, or College Program for Secondary School Students), will count in the SEAS quality-point index if the courses are part of the SEAS curriculum.

Humanities, Social Science, Technical Elective, and Graduate-Level Course Grades—Courses taken in excess of the number required to fulfill the social science, humanities, or technical elective requirements (including graduate-level courses) are not included in determining probation/suspension/graduation/Dean's List status. Only those courses initially taken to meet the requirements will be included in computing the requirements of these categories.

Quality-Point Index—Scholarship is stated in terms of the quality-point index. The index is obtained by dividing the student's total number of quality points by the total number of semester hours for which the student registered.

Quality points are computed from grades as follows: Each grade is assigned a numerical equivalent: *A*, 4.00 points; *B*, 3.00 points; *C*, 2.00 points; *D*, 1.00 point; *F*, no points. The quality points for a course are obtained by multiplying the credit hours of the course by the numerical equivalent of the grade achieved. Courses marked *W*, *I*, or *Z* are not considered in determining the index. Courses marked *I* will be included in the quality-point index once the *I* is converted to a regular letter grade. This grade will be included in the quality-point index for the semester in which the grade is assigned. Grades in courses taken at other institutions are not considered in computing the quality-point index, with the exception of courses taken at one of the Consortium universities.

Grades of I or P/NP—If a grade of *I* is not changed to a letter grade of *A*, *B*, *C*, *D*, *F*, or *Z* within 30 days, then decisions on probation, removal from probation, suspension, Dean's List, and graduation will be made with the information on hand, in conformance with SEAS regulations, excluding the *I* grade(s).

Students whose status of probation or suspension depends on a grade of *P* are given 30 days to have the grade changed. If not changed by the end of that period, the P will be considered a C for probation/suspension/graduation Dean's List purposes, and a grade of *NP* will be considered an *F*. Students may not be considered for the Dean's List with a *P* in their record for the semester in which the *P* was received.

Mid-semester Warning—At the end of the seventh week of each semester, instructors are expected to report to the dean the names of students whose scholarship is unsatisfactory. On receipt of a warning notice, students must consult with the appropriate instructor and their adviser immediately. The adviser may prescribe diagnostic tests or remedial study, or both, to be completed before the end of the current semester.

Probation—A full-time student (one taking 12 semester hours or more) will be placed on probation if his or her quality-point index is less than 2.0 for one semester or if he or she receives two or more grades of *F* in one semester or summer session. A part-time student (one taking fewer than 12 semester hours) will be placed on probation if his or her quality-point index is less than 2.0 or he or she has received two or more grades of *F* when he or she has accumulated 12 semester hours over more than one semester or summer session. For academic purposes, a new grading period will begin once this accumulation is reached.

Students on probation who receive a quality-point index of 2.0 or better (for 12 or more credit hours) during the semester on probation but also receive a grade of *F* will be placed on continued probation. Students in this category who receive two *F*s will be suspended.

Removal from Probation—A full-time student will be removed from probation when his or her quality-point index is 2.0 or more with no grade of *F* during the semester on probation. A part-time student will be removed from probation when his or her quality-point index is 2.0 or more and he or she receives no grade of *F* for the next 12 semester hours after being placed on probation.

Suspension—The following cases constitute grounds for suspension: (1) receipt of two grades of *F* any time during a probation period (part-time students receiving two grades of *F* while on probation will be suspended at the time of receipt of the second of these grades); (2) placement on probation in two consecutive semesters (or the equivalent for part-time students); (3) receipt of four grades of *F* in any semester (or the equivalent for part-time students); (4) placement on probation for a third time, whether or not the probation periods are consecutive; (5) accumulation of a quality-point index of (a) 1.5 or less at the end of the sophomore year or upon completion of the 63rd credit in the student's curriculum, (b) 1.9 or less at the end of the junior year or upon completion of the 97th credit in the student's curriculum, or (c) less than 2.0 at any time during the senior year.

Department faculty may designate additional courses to be taken and grades to be received by students who fail to meet but come close to meeting the graduation requirements. Suspension may be held in abeyance until the conditions are or are not met.

Students admitted on probation will be suspended if they do not attain a quality-point index of 2.0 during their first semester (12 or more credit hours) or if they receive 2 or more grades of *F* during the period.

Dean's Honors and Commendation Lists—The faculty of the School recognizes meritorious scholastic achievement by a Dean's Honors List and a Dean's Commendation List, which contain the names of candidates for undergraduate degrees whose scholastic achievements satisfy all of the following requirements while enrolled in an approved engineering curriculum:

1. The student must have completed a minimum of 13 semester hours in one semester with a quality-point index of 3.5 or higher for the Dean's Honors List and a quality-point index of 3.0 or higher for the Dean's Commendation List, with no more than one grade of *C*.
2. No grade below *C* may have been received during the qualifying period.
3. No disciplinary action may have been taken against the student.

The grades used to compute the quality-point index for eligibility for the Dean's Honors and Commendation Lists are those used to meet the SEAS graduation requirements. A student who receives a grade of *I* during a semester will not be placed on the Dean's Honors or Commendation List for that semester unless the *I* is removed no later than two months after the end of the marking period and the student continues to meet all the requirements for the Dean's Honors or Commendation List.

Note—Grades discussed in the paragraphs above include all grades earned at George Washington University and through the Consortium universities while the student is enrolled at George Washington University. The grades considered are for academic courses taken in fulfillment of degree requirements and as prerequisites for degree requirements, and not for other courses that may be taken for remedial or deficiency reasons. (For example, EFL courses numbered 45 and below will not be considered for purposes of probation, suspension, or Dean's List.)

Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the associate dean. The associate dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up any such deficiency in English to the satisfaction of the associate dean.

Graduation Requirements

See page 260 for **general requirements for graduation**.

Residence

A minimum of 30 semester hours must be completed in residence. Summer work may be counted. Unless special permission is granted by the dean to study elsewhere, the work of the final year must be completed in residence.

Scholarship

To be eligible for graduation a student must have (1) a quality-point index of at least 2.20 in those technical courses specified in the fifth through the eighth semesters of the curriculum and (2) a 2.00 overall average for the entire engineering academic program taken at SEAS.

Honors

With Distinction—A bachelor's degree may be conferred "With Distinction," at the discretion of the faculty, if a student attains a quality-point index of 3.50 or higher on all work taken at this institution that applies to his or her engineering program. To be eligible for this honor, a student must have completed at this institution at least one-half of the work required for the degree.

Special Honors—A bachelor's degree may be conferred with "Special Honors," at the discretion of the faculty, for outstanding achievement in the student's senior-year work on recommendation of the faculty, under the following regulations:

1. The student must have candidacy for Special Honors approved by the department chairman representing the major field not later than the beginning of the senior year.
2. The student must meet such other conditions as may be set at the time candidacy is approved.
3. No student will be awarded Special Honors unless a quality-point index of a least 3.00 is achieved on all work taken at this institution that applies to his or her engineering program.
4. To be eligible for Special Honors a student must have completed at this institution at least one-half of the work required for the degree.

Undergraduate Curricula

The four-year undergraduate curricula lead to the degree of Bachelor of Science, with parenthetic designation of the major—for example, Bachelor of Science (Electrical Engineering). Students who are deficient in preparation require a longer period; those who are admitted with advanced standing or who attend summer sessions can complete the requirements in less time.

The program of the first four semesters (core curriculum), with minor exceptions, is common to all curricula and provides the essential broad base of scientific principles and mathematical techniques necessary for the professional courses of the last four semesters, together with an appropriate background in the humanities and social sciences (see Courses in the Humanities and Social Sciences, page 26).

A minimum of 130 semester hours is required to qualify for the degree. Certain curricula may require more than the minimum. However, students are encouraged to elect additional course work above the required minimum to the extent that their interests and the School's offerings permit.

Degrees are offered in Civil Engineering, Computer Science, Electrical Engineering, Mechanical Engineering, and Systems Analysis and Engineering. Students in Mechanical Engineering may select options in Combustion and Environmental Engineering, Computer-Aided Design, Energy and Power, Fluid Mechanics and Thermal Sciences, Mechanical Engineering Design, and Solid Mechanics and Materials Engineering. Electrical Engineering provides options in Computer Engineering and Premedical Engineering. Systems Analysis and Engineering majors must choose an elective track from one of the following areas: Computer Systems, Control and Instrumentation Systems, Electrical Energy Systems, Electro-mechanical Systems, Environmental Systems, Financial Systems, Management Decision Systems, Mathematical Systems, Mechanical Energy Systems, Network Systems, Naval Systems, Production Systems, or Statistical Systems.

Preregistration

Students are encouraged to preregister for courses for the following semester. They are cautioned, however, that preregistration in a program of courses is predicated on satisfactory completion of all prerequisites for the courses and on meeting scholastic requirements.

The School reserves the right to cancel the preregistration of any student who has not met the requirements for satisfactory academic performance.

Courses in the Humanities and Social Sciences

The program in the humanities and social sciences for engineering students assists them in acquiring knowledge that will permit understanding of the social and humanistic elements of the past and present and analysis of problems facing society today. The ultimate goal is to help the engineer have a better understanding of society and an appreciation of the engineer's role and responsibilities within it.

Since the education of an engineering student is, by necessity, oriented toward technical subjects, the program in the humanities and social sciences should not emphasize technical aspects and skills but should consist of courses that broaden the student's outlook. As a consequence, courses in subjects such as accounting, finance, industrial management, introductory languages, and personnel administration should not be included in the humanities and social sciences program. On the other hand, courses in areas such as anthropology, economics, geography, history, literature (including foreign-language literature), philosophy, political science, psychology, and sociology are considered appropriate.

With the assistance of his or her faculty adviser, each undergraduate engineering student is required to prepare a program of courses in the humanities and social sciences, explaining how the program meets the purpose stated above. The student's program must include a minimum of 18 semester hours, of which at least two courses (6 semester hours) must form a sequence within one subject area. It must also contain courses selected from *both* the humanities and social sciences and not be confined to one or the other. Approval of the program must be received from both the adviser and the departmental chairman.

Modern Computing and Laboratory Facilities and Research Opportunities

Laboratories at the School of Engineering and Applied Science are constantly updated to keep them in line with current engineering practice. Assignments in the classroom and laboratory are arranged so that they supplement each other.

The learning experience is made more meaningful when coupled with research activities. Students may involve themselves in the various kinds of research activities in progress at SEAS. Research is being conducted in structural mechanics, fluid mechanics, thermal sciences, materials science, medical engineering, computer science, electronics, communications networks, energy technology, and other areas.

SEAS provides a wide variety of computing facilities for student and faculty use. Located on the fourth floor of Tompkins Hall, the SEAS Computing Facility includes a network of Apple II and Apple III microcomputers, a VAX 11/780 super minicomputer system for graphics research and instructional computing, and a graphics laboratory with advanced color and high-resolution graphic systems.

SEAS has been awarded an IBM 4341 Group II computer system configured for computer-aided design and manufacturing applications. This system includes 16 megabytes of main memory, on-line disk storage, color graphics workstations, communications, timesharing terminals, and a variety of distributed processors, including personal computers and a multi-tasking laboratory system. Extensive software support, including graphics systems for CAD

CAM, three-dimensional interactive graphics packages, packages for computer-aided design of printed-circuit boards, computer-aided engineering design programs, and data base support will also be provided with this system.

The facility provides technical and operational assistance to all users during the hours of 12 noon–12 midnight, Monday–Thursday, and 12 noon–6 p.m., Friday–Sunday.

Additional computing facilities, not under the purview of the SEAS Computing Facility, are available to students and faculty at the Center for Academic and Administrative Computing (see page 262) and throughout the various specialized laboratories in SEAS.

The various laboratory facilities available to complement classroom study and conduct research also include:

Two General Purpose Electronic Laboratories—for work in basic electronics, digital electronics design, instrumentation, networks, solid state devices, switching circuits, and advanced electronics design. Each laboratory is fully equipped with state-of-the-art Tektronix oscilloscopes, spectrum analyzers and curve tracers, Keithley digital multimeters, Wavetek and HP function generators, Lambda power supplies, and HP universal counters.

A Computer Science Laboratory—with a PDP 11/34 minicomputer system, a microprocessor development system, and modern microcomputer trainers.

A Computer-Aided Design and Graphics Laboratory—supported by the VAX 11/780 Computing System and including a Ramtek 9400 high resolution color graphics system with Matrix camera, two Tektronix graphics terminals, an Apollo Domain Node, a Megatek Wizard workstation, two Seiko D-Scan color graphics workstations and an inkjet hardcopy printer, an Evans & Sutherland PS 300 graphics system, a Printronix graphics printer, and a Watanabe XY 10 pen plotter.

Two Computer-Aided Design Laboratories—supported by the IBM 4341 Computing System featuring nine IBM 3250 Graphics Systems and eight of IBM's new generation, high performance, 5080 Graphics Systems. Both systems are complemented by the full spectrum of IBM engineering and scientific software. System output is available through a combination of graphics printers and plotters, including an IBM 4250 publications quality printer and an IBM 7375 Color Plotter capable of "E" size engineering drawings.

An Artificial Intelligence (AI) Laboratory—with 3-bit mapped graphics, mouse-driven, Xerox 1108 AI workstations with Ethernet and Expert Systems Software, and an IBM 3270 PC with color printer.

A Decision Support Systems Laboratory—housing 12 IBM Personnel Computers with full graphics capability and a Sony overhead projection system for classroom demonstrations of interactive computer applications.

A Communications, Microwave, and Laser Laboratory—with state-of-the-art signal analysis and signal generation equipment, admittance meters, impedence meters, RX meters, slotted sections, hetrodyne detection systems, matched terminations, helium-neon lasers, and fiber optics emitters and detectors.

A Communications Research Laboratory—outfitted with a PDP 11/44 Computing System.

A Power Systems Laboratory—equipped with fractional horsepower machinery and instrumentation for experiments in support of the design and analysis of electrical power systems.

A Control Systems Laboratory—utilizing microcomputers to control heat, air pressure, motor speed, timers, printers, plotters, and A/D converters through the application of transfer functions.

Medical Engineering Laboratories—containing equipment for study and research in a variety of neurological areas, such as electroencephalography and sensory evoked potentials, and for development in medical data acquisition and analysis.

An Interactive Systems and Robotics Laboratory—providing a wide variety of input/output computer peripherals in a integrated, easy-to-use environment. Major equipment includes a Z-80-based microcomputer, an EAI TR20 analog computer, a PA/A Diatonic 3-octave keyboard for sound and music synthesis, and two mechanical mobile robots.

A Combustion Diagnostics Laboratory—with diagnostic equipment using laser scattering concepts and a computer-based data acquisition and analysis system.

Fluid Mechanics and Hydraulics Laboratories—complete with a 35-foot tilting water flume with self-contained circulatory system, a circulating water tunnel, hydraulic benches, fully instrumented subsonic wind tunnel and a 4×6-foot Autotrol Digitizer for conversion of geomorphic river data into digital data.

An Environmental Engineering Laboratory—with an atomic absorption spectrophotometer for trace metal analysis, a gas chromatograph, a high-pressure liquid chromatograph, and a computerized data system for trace organic analysis.

Materials Laboratories—with three material testing systems having capabilities of 11,000, 22,000, and 110,000 pounds; a Tinius Olsen Universal Testing machine with a 400,000 pound capacity; several torsional fatigue machines; a torsional creep facility; a Charpy impact tester; and specimen preparation facilities. Analytical equipment includes two Lietz optical metallographs, a scanning electron microscope with energy dispersive x-ray analysis, and a transmission electron microscope.

A Propulsion Laboratory—equipped with both continuous flow and blow down air supply systems for the study of new propulsion techniques.

A Soil Mechanics Laboratory—well equipped for determining the classification, strength, compressibility, and general engineering properties of soils.

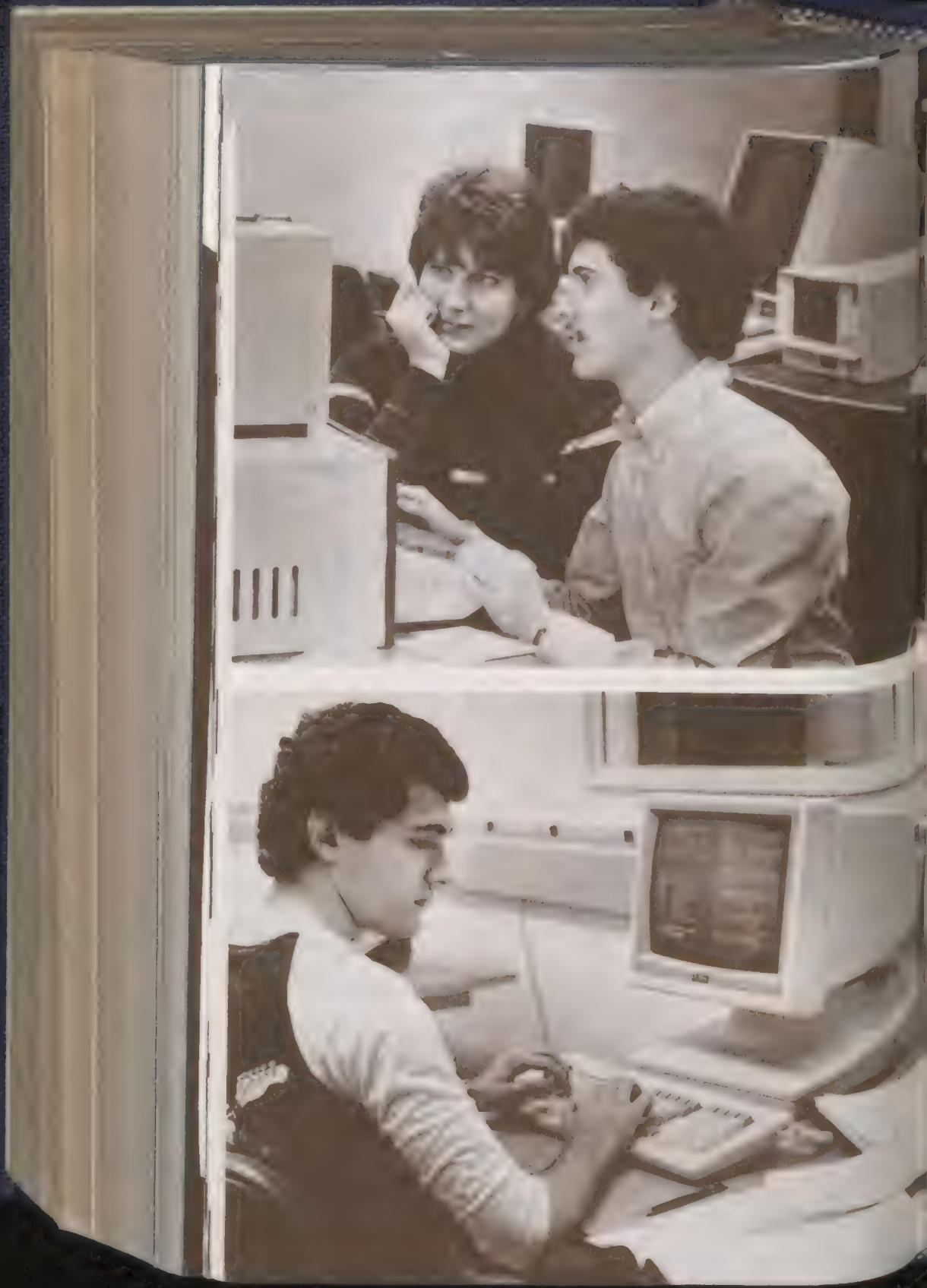
Thermal Sciences and Instrumentation Laboratories—designed to support experiments in the various heat transfer processes and familiarize students with the latest in mechanical engineering measurement and instrumentation techniques.

A High Vacuum Vapor Disposition Facility—capable of depositing coatings of metals or ceramics on substrates of interest.

Arrangements may be made also for use of special equipment at various government laboratories, such as the Naval Research Laboratory, the National Bureau of Standards, and the National Aeronautics and Space Administration.







Graduate Study

The School of Engineering and Applied Science offers graduate study leading to the degrees of Master of Science, Master of Engineering Administration, and Doctor of Science and to the professional degrees of Engineer and Applied Scientist.

In its graduate programs as in undergraduate study, the School adheres to the educational philosophy of increasing the knowledge and understanding of the individual student by concentration on principles and their application rather than by encyclopedic coverage of techniques and specialized detail. Each program is individually planned according to the student's preparation and needs.

Graduate study may be undertaken in any field of engineering or applied science in which the School has established a formal program of studies and for which there are adequate facilities and resources. Upon approval of his or her adviser, the student may select courses in other departments of instruction in the University to serve specific needs or objectives. A complete list of available fields and areas of concentration is included under each departmental listing in the Programs of Study and Courses of Instruction section of this *Bulletin*.

Master's Degree Programs

The student's program may provide for broad coverage in a variety of fields or may be designed to provide concentration in particular areas. The minimum program consists of 24 semester hours of approved graduate courses and a master's thesis (equivalent to 6 semester hours). With the approval of the department, the student may elect an optional program without a thesis that consists of a minimum of 33 semester hours of approved graduate courses. All master's candidates are required to pass a Master's Comprehensive Examination. Students whose undergraduate study does not include necessary prerequisites may be required to take more than the minimum semester hours required.

Upon admission the student is assigned an adviser. Programs of study are determined by any prerequisites established and by the requirements of the department in which the student wishes to study. The program of studies in preparation for the Master's Comprehensive Examination must be approved by the student's adviser and the appropriate department chairman.

Admission

Admission to graduate study toward a master's degree requires an appropriate bachelor's degree from a recognized institution and evidence of capacity for productive work in the field selected, such as may be indicated by undergraduate grades, Graduate Record Examination (GRE) scores, and similar data. (GRE scores are not required for admission to SEAS; however, students who have taken the GRE are encouraged to submit their test results.)

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate courses as an unclassified student before being admitted to degree candidate status. In some cases, if such deficiencies are minimal, he or she may be admitted directly to degree

candidate status and allowed to take a limited number of graduate courses while completing the undergraduate courses in which he or she is deficient. In no case may the undergraduate deficiency courses thus taken fulfill any part of the requirements for the master's degree.

For additional admissions requirements for the degrees of Master of Engineering Administration and Master of Science in the Department of Engineering Administration, see pages 187, 196, and 203; for the degree of Master of Science in the Department of Operations Research, see page 225. Candidates for the degree of Master of Science in the Department of Electrical Engineering and Computer Science must have satisfied specific undergraduate requirements, depending upon the area of concentration.

Admission Procedure

Admission application forms are available from the School of Engineering and Applied Science. They must be submitted with the nonrefundable application fee of $35 to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052, no later than August 1 for the fall semester, December 15 for the spring semester, May 1 for the first summer session, June 1 for the second summer session, and July 1 for the third summer session. The applicant must request that each educational institution attended since high school graduation send an official transcript of the student's record directly to the manager of engineering admissions. Although GRE scores are not required, the applicant who has completed the GRE should request that the scores be sent to the School. The applicant will be notified by mail when a decision on admission has been made. English language and other pertinent requirements for international students are outlined on pages 15–18.

Normally, graduate students who have been suspended from SEAS must wait at least one year before applying for readmission.

All inquiries and correspondence relative to graduate admission should be directed to the manager of engineering admissions.

English Language Requirements for International Students

If a student's native language is not English, the student must demonstrate proficiency in English before a decision will be made on his or her admissibility. The Test of English as a Foreign Language (TOEFL) and the American Language Institute of Georgetown University (ALIGU) test are recognized by George Washington University. The results of one of these tests must be forwarded by the institution administering the test.

Program Assignments Based on English Test Scores—Admitted students (except those admitted to the Department of Engineering Administration—see next paragraph) achieving a score of 550 or higher on TOEFL or 85 or higher on the ALIGU will not have to take any additional English tests to determine the technical program they will follow at the School of Engineering and Applied Science.

Students whose native language is not English and who are newly enrolled in any degree program offered by the Department of Engineering Administration must take, prior to registration, the English as a Foreign Language placement test. The test is administered by the English for International Students office. The results of the test will determine the necessity for English as a Foreign Language course work, which, if required, will be preliminary to any other course work taken at the University.

International students who are admitted and whose scores range between 425 and 550 on TOEFL or between 55 and 84 on the ALIGU will be required to take the GWU English as a Foreign Language placement test to determine the level of the English course to be taken and the maximum number of technical courses, if any, that can be taken in any semester. Students admitted with English requirements should expect to spend more than the normal amount of time in completing their studies at the University than do native (U.S.) students.

International students who score below 425 on TOEFL or below 55 on the ALIGU test will not be admitted to the University in full degree status. However, international students seeking admission to the School who have met all of the normal technical requirements for admission *with outstanding academic records* but do not meet the English language requirements may be admitted on a provisional admission basis. Such students may enter full admission status only when they have successfully completed the level of EFL 30 (see page 17) within one calendar year of the date of registration.

International students transferring from an academic institution in the United States or from another English-speaking institution, or who have demonstrated English proficiency at those institutions, may be admitted without a TOEFL or ALIGU test at the discretion of the admitting officer, but they may be required to take the GWU English as a Foreign Language placement test prior to registration.

International students in the United States who are able to schedule the English as a Foreign Language placement test at George Washington University may use the results of this test in lieu of the TOEFL or ALIGU test.

Transfer Credit

Up to 6 semester hours of satisfactory credit (with grades of *A* or *B*), which normally must have been earned in a graduate program at another recognized institution, *may* be accepted in transfer, when applicable, to satisfy master's degree requirements in this School. However, students must, with the approval of their adviser, petition the appropriate department chairman for such a transfer. Credits used in obtaining a previous degree may not be used for another degree at SEAS.

Registration

A graduate student may register for classes upon presentation of an official letter of admission or a Student Identification Card from the previous semester. No registration is accepted for less than a semester or one summer session.

Concurrent registration in this School and in another institution not a member of the Consortium of Universities of the Washington Metropolitan Area, Inc., or another division of this University requires the written permission of the deans concerned *prior to registration*. Allowance of credit for work completed concurrently at another institution is at the discretion of the dean upon approval by the student's adviser. The necessary forms for requesting concurrent registration are available from the SEAS Admissions Office.

Dates of registration are stated in the Calendar (page 4), and hours and procedures are stated in the *Schedule of Classes*, which is published in advance of each semester.

Preregistration

Students are encouraged to preregister for courses for the following semester. Students are cautioned, however, that preregistration in a program of courses is predicated on satisfactory completion of all prerequisites for the courses and on meeting scholastic requirements.

The School reserves the right to cancel the preregistration of any student who has not met the requirements for satisfactory academic performance.

Continuous Registration/Leave of Absence

The School has specific rules governing continuous registration. Students may register in one of the following categories: (1) Inactive Status/Leave of Absence—(a) while awaiting graduation (all other requirements completed), (b) while attending classes at another institution, (c) while temporarily transferred out of the area (e.g., military TDY), (d) for temporary medical problems, or (e) for a cooperative education work assignment or (2) Continuous Research (1–12 semester hours)—(a) to take the comprehensive or qualifying examination or (b) to complete thesis or dissertation research. Students who wish to register in one of these categories should contact the School's Admissions Office.

Master's Thesis

In those programs requiring a thesis, the degree candidate must submit an acceptable thesis to demonstrate the ability to make independent use of the knowledge and discipline of thought acquired and developed by graduate study, to furnish objective evidence of constructive power in a given field, and to demonstrate the ability to communicate the results of the work in writing. Work of a suitable character for which the student has professional responsibility may be considered, whether done on or off campus, provided no significant amount of work is completed without faculty supervision.

As a part of registration for the thesis course (299), the candidate must submit the thesis area to the appropriate department chairman, on the form obtained from the department office and approved by the faculty adviser. The candidate must submit the thesis title to the dean, on the form available in the department office, at the beginning of the semester of expected graduation. Registration in the thesis course sequence 299–300 entitles the student, during such registration, to the advice of the faculty member under whom the thesis is to be written. Students may consult their adviser, but they have primary responsibility for the thesis.

The thesis in final form must be submitted to the appropriate department chairman by the date stated in the calendar for the semester in which the candidate enrolls in thesis course 300. In the event a thesis is unfinished on the date specified, the student will be granted an additional semester. If the preparation of the thesis extends beyond the three semesters, approval for an extension of time will be required and the student must reregister for thesis course 300 and pay tuition as for a repeated course. The overall time limit for earning the degree (see page 37) may not be exceeded.

A thesis may be submitted in final form one time. The acceptability of the thesis is determined exclusively by the Master's Comprehensive Examination committee. If the thesis is unacceptable, the student's graduate status is terminated.

Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the appropriate department office. Accepted theses, with accompanying drawings, become the property of the University and are deposited in the University Library, where the duplicate copies are bound and made available for circulation.

Optional Master's Program Without a Thesis

With the approval of the appropriate department, a student may elect an optional program without a thesis that consists of a minimum of 33 semester hours of approved graduate courses.

Master's Comprehensive Examination

The student must pass a Master's Comprehensive Examination to demonstrate substantial understanding of principles and methods and their use in the area of interest. This examination may be written, oral, or both. A graduate student who fails any portion of the Master's Comprehensive Examination on the first attempt may be examined one more time if approval is given by the appropriate examining committee. In the event of failure to complete the examination satisfactorily, the student's graduate status terminates.

Regulations

Regulations regarding registration, fees, and finances are stated on pages 242–257; other University regulations, on pages 257–262.

Attendance

Students may not attend classes until registration is completed and fees due are paid or appropriate arrangements are made with the Office of Student Accounts. They may attend only those classes for which they are registered. Students are expected to attend every meeting of the course in which they are registered, fully prepared to carry on the work required. Students may be dropped from any course for undue absence.

Scholarship

Grades are indicated as *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *CR*, Credit (for satisfactory thesis completion); *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Unauthorized Withdrawal.

At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond his or her control, is unable to complete the work of the course and if the instructor is informed of and approves such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course that is not satisfactorily explained to the instructor before the date when grades must be

turned in will be graded *F*. If acceptable reasons are later presented, the instructor may initiate an appropriate grade change. Although the grade of *I* may remain on the records for a maximum of one year, the instructor should normally set a much briefer period within which the uncompleted work must be made up. The grade of *I* cannot be removed by the student's reregistering for the course here or taking its equivalent elsewhere. An incomplete that is not removed within one calendar year is automatically changed to an *F*. The symbol *Z* is assigned when a student is registered for a course that he or she did not attend and for which he or she has not done substantial work. The grade of *Z* will not be considered in determining the quality-point index.

A student who receives two grades of *F* or *Z*, or a combination of both, or three grades below *B* is barred from further enrollment in graduate courses and, ordinarily, will not be readmitted as a degree candidate.

A student may not repeat for credit a course in which he or she has received a grade of *C* or above, unless required to do so by the department concerned. A written statement requiring the student to repeat such a course for credit must be submitted to the registrar by the appropriate department chairman.

Pass/No Pass Grading System—SEAS students may take SEAS courses under the pass/no pass grading system, but credit for such courses cannot be used toward any degree program in SEAS.

Graduation Requirements

Thesis—In addition to 6 semester hours of acceptable thesis, a student may graduate with either:

1. 24 semester hours of *B* or better with no more than two grades below *B*, of which only one *F* is permitted; or
2. A 3.00 quality-point index for a minimum of 24 semester hours with no more than two grades below *B*, of which only one *F* is permitted.

Nonthesis Option—A student may graduate with either:

1. 33 semester hours of *B* or better with no more than two grades below *B*, of which only one *F* is permitted; or
2. A 3.00 quality-point index for a minimum of 33 semester hours with no more than two grades below *B*, of which only one *F* is permitted.

Quality-Point Index—Scholastic standing is computed in terms of the quality-point index, obtained by dividing the number of quality points by the number of semester hours for which the student registered.

Quality points are computed from grades as follows: *A*, 4.00 points; *B*, 3.00 points; *C*, 2.00 points; *F*, no points, for each semester hour for which the student registered. Courses marked *W*, *I*, or *Z* are not considered in determining the index, except that courses marked *I* will be considered when a formal grade is recorded. Grades in courses taken at other institutions are not considered in computing the quality-point index, with the exception of courses taken at one of the Consortium universities.

Residence and Continuous Study

All work for the degree must be done in residence on the campus except when special permission is granted by the department chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration, and the student must apply for readmission to the master's degree program under whatever conditions and regulations are in effect at that time.

Time Limits

A full-time student in the master's program is allowed a maximum of three calendar years (excluding the time spent taking only English as a Foreign Language courses) to complete all degree requirements, from the date of first degree candidate status registration in prerequisite or graduate courses. A part-time student in the master's program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to degree candidate status, nor does it encompass any specified period spent on approved leave of absence.

Students who do not complete degree requirements within the allowed time will have their degree candidate status terminated. They may be readmitted to degree candidate status under conditions specified by the department chairman and approved by the dean.

Professional Degree Program

The School of Engineering and Applied Science has established the professional degree program to provide an educational program for those students who are interested in pursuing course work beyond the master's degree, with emphasis on applied subject material rather than on basic research.

Successful completion of the professional degree program leads to the degree of Engineer or of Applied Scientist.

In the professional degree program, the School adheres to the educational philosophy of increasing the knowledge and understanding of the individual by concentration on principles and their application. This approach should provide the students with a technical flexibility to enable them to adapt successfully to rapidly changing technology. Each program is individually planned according to the student's background and needs and is subject to departmental requirements.

The professional degree program has been designed to satisfy the needs of industry and government for highly trained and educated technical personnel in engineering and applied science.

Professional Degree Study Programs

The professional degree program provides graduate study in those fields of engineering or applied science in which the School has established a formal program of studies and for which there are adequate facilities and resources. Upon approval, the student may select courses in other departments of instruction in the University to serve specific needs or objectives.

The student's program may provide broad coverage in a variety of fields or concentration in particular areas. The minimum program consists of 30 semester hours of approved graduate courses beyond a master's degree. Students whose graduate study does not include necessary prerequisites may be required to take more than the minimum semester hours required.

Admission

Admission to graduate study toward the professional degree requires an appropriate master's degree from a recognized institution and evidence of

capacity for productive work in the field selected as indicated by prior scholarship and, where appropriate, professional experience. The Department of Electrical Engineering and Computer Science requires candidates for the professional degree program to have had two years of professional experience after having received the master's degree.

Requirements

Engineer—To study toward the degree of Engineer, an applicant must possess a master's degree and a bachelor's degree in an area of engineering.

Applied Scientist—To study toward the degree of Applied Scientist, an applicant must possess a bachelor's degree in either engineering, mathematics, or natural science and a master's degree in either engineering, natural science, mathematics, or administration. Applicants having an equivalent quantitative background may be considered as special cases by the respective departments.

Normally, a *B* average in graduate work is required. However, the minimum does not assure automatic acceptance; the departments may, and often do, set higher admission standards.

Admission Procedure

Forms for application for admission are available at the School of Engineering and Applied Science. They must be submitted with the nonrefundable application fee of $35 to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052, no later than August 15 for the fall semester, December 15 for the spring semester, May 1 for the first summer session, June 1 for the second summer session, and July 1 for the third summer session. The applicant must request each educational institution attended since high school graduation to send an official transcript of the student's record directly to the Manager of Engineering Admissions. The applicant will be notified by mail when a decision on admission has been made. English language and other pertinent requirements for international students are on pages 15–18.

All inquiries and correspondence relative to graduate admission should be directed to the Manager of Engineering Admissions.

Transfer Credit

Up to 6 semester hours of satisfactory credit (with grades of *A* or *B*) beyond a master's program, which must have been earned in the five years preceding the start of study toward the professional degree, may be accepted in transfer when applicable to satisfy professional degree requirements in this School. However, students must, with the approval of their adviser, petition the appropriate department chairman for such a transfer. Credit used in obtaining a previous degree may not be used as transfer credit.

Program of Study

Upon admission, the student is assigned an adviser. Programs are determined by established prerequisites and the requirements of the department in which the student wishes to study. The program of studies of each professional degree candidate must be approved by the student's adviser and the appropriate department chairman.

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate and graduate courses as an unclassified student before being admitted to professional degree candidate status. In no case may courses thus taken fulfill any part of the requirements for the professional degree.

Each individual department may require the degree candidate to undertake and defend the results of a technical design project, a development problem, or the preparation of a comprehensive technical report to demonstrate the candidate's ability to make independent use of the knowledge and discipline of thought acquired and developed by graduate study. When applicable, the student will be informed of this requirement by the faculty adviser at the time the student's program is being formulated.

In no case, however, will this project be more than 6 semester hours out of a minimum of 30 semester hours.

Scholarship

No student studying for the professional degree may receive more than two course grades below *B*. If more than two course grades below *B* are received, study is terminated and further enrollment is prohibited. A student must achieve a final quality-point average of 3.00 to receive the degree.

Time Limits

A full-time student in the professional degree program is allowed a maximum of three calendar years to complete all degree requirements, from the date of the first degree candidate status registration in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to degree candidate status, nor does it encompass any specified period spent on approved leave of absence.

Students who do not complete degree requirements within the allowed time will have their degree candidate status terminated. They may be readmitted to degree candidate status under conditions specified by the department chairman.

Interrelationship with the Doctoral Program

Candidates for the Doctor of Science degree or professional degree who are in good academic standing may, with the approval of the faculty adviser and department chairman, transfer from one degree program to the other if they meet necessary qualifications and requirements as specified by the appropriate department.

Residence and Continuous Study

All work for the degree must be done in residence on the campus except when special permission is granted by the department chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration, and he or she must apply for readmission to the professional degree program under whatever conditions and regulations are in effect at that time.

Doctoral Degree Program

The School of Engineering and Applied Science offers a program of advanced study and research leading to the degree of Doctor of Science. This program is limited to those fields in engineering or applied science in which a discipline has been established and for which the University has or can arrange adequate resources.

The doctoral program is designed to prepare the student for a career of creative scholarship by providing a broad but balanced background of knowledge and guidance in the performance of research. It requires study of interrelated fields of learning as well as original research in the field of central interest.

The program for the degree is divided into two stages. The first—made up of a study of interrelated fields of learning that supports the general area of research concentration—culminates in the qualifying examination. The second—composed of research investigation of a particular subject in a special field and the presentation of such research findings in a written dissertation—culminates in the final examination.

Admission to Doctoral Study

A satisfactory master's degree from an accredited institution is required together with acceptable personal qualities and a capacity for creative scholarship. Normally, a *B* average in graduate work is required. However, the minimum does not assure automatic acceptance; the departments may, and often do, set higher admission standards.

Admission Procedure

Forms for application for admission are available at the School of Engineering and Applied Science. They must be submitted with a nonrefundable application fee of $35 to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052. The prospective doctoral student seeking admission should apply before August 1 for the fall semester and before December 1 for the spring semester. Personal interviews may then be arranged to discuss the applicant's qualifications and the possibilities for an effective doctoral program. The applicant must arrange for complete documentary records (transcripts) to be forwarded to the Manager of Engineering Admissions in sufficient time to permit assembly of complete records for evaluation as soon after the above application deadlines as possible.

The applicant must arrange for letters of recommendation to be submitted from two faculty members of the institution from which he or she received the master's degree; one of these, if possible, should be from the master's adviser. The letters should be addressed to the appropriate department chairman.

English language and other pertinent requirements for international students are given on pages 15–18.

Language Requirement

The importance of scientific and technical contributions originating from foreign countries is emphasized. Some areas of study demand the capability of reading appropriate literature in a foreign language. In such situations

individual departments have the option of requiring reading knowledge of such a language.

Tool Requirement

In addition to or in lieu of the language requirement, an examination in a tool requirement (*e.g.*, computer programming) may be established by the various departments.

Study for the Qualifying Examination

Upon admission to the first stage of the program (*i.e.*, study of interrelated fields culminating in the qualifying examination), the student is assigned a faculty adviser who directs his or her studies. The adviser approves appropriate fields of study to insure the student's breadth of knowledge and to support research in the central field of interest, gives advice concerning the scope and content of fields of study, and guides preparation for the qualifying examination. In some departments, instead of a faculty adviser a faculty committee may be appointed to approve programs, direct study, and carry out all other responsibilities of the faculty adviser. Programs of study are normally structured to include a major field of study and two minor or supporting fields.

A minimum of 30 semester hours of credit in a formal program at the graduate level beyond master's study is required. In many cases, particularly when the student undertakes a doctoral program in a field other than that in which the master's degree was obtained, the program of study exceeds 30 semester hours.

Students admitted to doctoral study are encouraged to undertake one year of full-time study on campus. In general, the adviser will require the student to register for a minimum of 6 semester hours of course work in every semester except the summer sessions.

Transfer of Credit

Up to 6 semester hours of credit earned in courses completed with the grade of *A* or *B* while enrolled in a doctoral program at another accredited institution may be accepted in transfer to satisfy doctoral requirements of this School, subject to the approval of the student's adviser and the department chairman. Credit earned in courses completed more than five years prior to admission to the doctoral program will not be accepted in transfer, and some departments may require that transfer credit must have been earned within a shorter period of time before admission. Credit for courses taken for a previous degree may not be transferred.

The Qualifying Examination

The purpose of the qualifying examination is to ascertain that the student's background and intellectual development are adequate to support doctoral research in the central field. (Some departments may administer a prequalifying examination prior to completion of the study program.) Qualifying examinations may be written or oral, or both, and are scheduled over a period of several days. They are conducted only during the fall and spring semesters on

dates established by the departments and are administered by a faculty committee. Upon favorable report of the examiners to the Dean through the appropriate department chairman, the student is admitted to candidacy for the degree; the student then begins specialized study and research under the supervision of a designated member of the faculty or, in special instances, an outstanding engineer/scientist who is not a member of the faculty.

The qualifying examination is the principal means used to determine the student's ability to qualify as a candidate for the doctoral degree and to enter the second stage of the program.

At the discretion of the committee that prepared the examination, the doctoral student may be given a second opportunity to qualify for candidacy in the event of failure in any part of the qualifying examination. In general, the entire qualifying examination must be retaken to qualify for candidacy.

Scholarship

To be admitted to the qualifying examination, the doctoral student must achieve an overall quality-point average of 3.20 (quality points are computed as follows: *A*, 4.00 points; *B*, 3.00 points; *C*, 2.00 points; and *F*, no points). No doctoral student may receive more than two course grades below *B*. If the student does receive more than two course grades below *B*, the graduate study is terminated and further enrollment is prohibited. Courses in which the student earns grades below *B* are not included in the total semester-hour requirement for the degree. Students who receive any grade below *B* are required to consult with their adviser for a review of their program of study and discussion of possible changes therein.

Research, Dissertation, and Final Examination

The student admitted to candidacy for the degree of Doctor of Science requests as director of research the faculty member under whom he or she wishes to conduct research. The faculty member may accept or reject such request. The research area is approved by the director. Throughout the remainder of the doctoral program, the candidate conducts dissertation research directly under the director. However, the student is not precluded from consulting with other members of the faculty as may be required, on an informal basis, and may be encouraged to do so by the director of research. A committee of the faculty, consisting of three members, including the director as chairman, will advise in the final preparation of the dissertation. The department chairman appoints such a committee on the recommendation of the director of research. Work on the dissertation is equivalent to a minimum of 24 semester hours. See pages 242–243 for minimum hour-loads for doctoral students.

The Dissertation

A dissertation is required as evidence of ability to perform original scholarly research and to present and interpret the results. The student is solely responsible for the content of the dissertation.

The aim of the student in this stage of candidacy is the production of a dissertation that embodies the results of an extended original study and includes material deemed worthy of publication in recognized scientific and engineering journals. The student is expected to attempt to publish the results of the research as soon as possible after he or she receives the degree and to

submit copies of the published material to the Dean. Credit must be given in the publication to the fact that the material is abstracted, summarized, developed, etc., from a dissertation submitted to George Washington University in partial fulfillment of the requirements for the Doctor of Science degree.

The candidate must submit to the appropriate department five complete copies of the dissertation and an abstract (not to exceed 350 words) of the dissertation no later than the date specified in the calendar (page 4). The abstract is included in the announcement of the examination and is reproduced by University Microfilms, Inc. One copy of the dissertation is also sent to University Microfilms, Inc.

Printed copies of detailed regulations regarding the form and reproduction of the dissertation, preparation of the abstract, and services offered by University Microfilms, Inc., are available at the department office. The successful candidate for the doctorate is required, before receiving the degree, to pay a fee to cover a part of the expense of printing the abstract of the dissertation and for the basic service rendered by University Microfilms, Inc. Accepted dissertations, with accompanying drawings, become the property of the University and are deposited in the Gelman Library, where bound copies are available for circulation.

The Final Examination

Upon acceptance of the dissertation by the committee, consisting of the director of research and two other faculty members of this School, which has assisted in supervising its final preparation, the candidate is presented for the final examination. The final examination is oral and is open to the public. The candidate must demonstrate a mastery of the special fields of study and of the materials and techniques used in the research. The committee of examiners will consist of not less than five members, three of whom must be full-time faculty members. The committee may include qualified experts brought to the University especially to participate in the examination. The director of research serves as advocate for the candidate. When the candidate satisfies the examining committee of the high quality and originality of the candidate's contribution to knowledge as well as the mastery of the scholarship and research techniques of the field, the committee of examiners recommends the candidate for the degree of Doctor of Science. The final examination is conducted only during the fall and spring semesters. The candidate should consult with the appropriate department chairman as to possible dates for the examination.

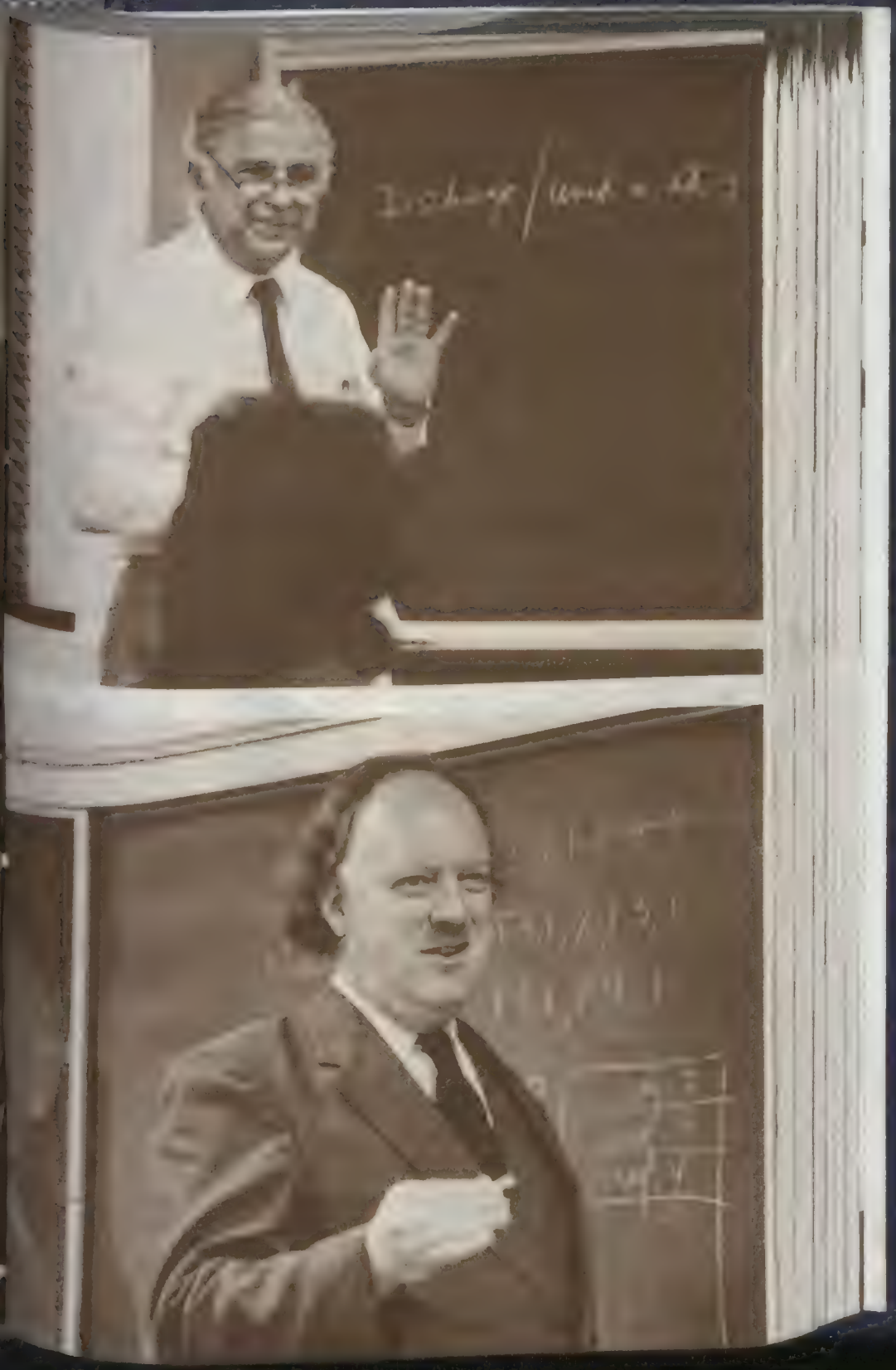
Residence and Continuous Study

All work for the degree must be done in residence on the campus, except when special permission is granted by the department chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the registration, and the student must apply for readmission to doctoral study under whatever conditions and regulations are in effect at that time. In case of incapacity or other legitimate reasons, the student may be granted a leave of absence of up to one year. Extension of such leave will require special request to and approval by the appropriate department chairman. During approved leave of absence, the student must maintain continuous enrollment. The time

period for completion of all requirements for the degree will be adjusted on the basis of the approved leave of absence.

In general, one year of study is the minimum amount of time to be spent in preparation for the qualifying examination. The qualifying examination must be completed within five years of the date of admission, and the entire degree program must be completed within seven years. After admission the student may apply for the qualifying examination whenever he or she feels properly prepared. A minimum of two years of full-time study and research should be expected in meeting the requirements for the degree.







Special Programs

Institute for the Study of Fatigue, Fracture, and Structural Reliability

The basic objective of the Institute for the Study of Fatigue, Fracture, and Structural Reliability of the School of Engineering and Applied Science is to develop an interdisciplinary approach to fatigue research through close cooperation of research workers from different fields. The Institute deals principally with the study of the physical mechanism of damage initiation in order to establish principles for the rational design of metal alloys of superior fatigue performance on the one hand and to develop advanced methods of fatigue design and reliability on the other. Because of the large volume, past and current, of straight fatigue testing of standard test specimens in industrial, government, and university laboratories, no testing of this type is generally conducted by the Institute. However, results of such tests appearing in publications and reports are carefully scrutinized for their significance in terms of the purposes of the Institute. In addition to advancing interdisciplinary research, the Institute provides specialized training for graduate students.

The Institute conducts seminars, issues technical reports, and supplies information, lectures, and consultations to many government and industrial research and development laboratories.

Institute for Management Science and Engineering

The Institute for Management Science and Engineering defines and develops new analytical management techniques required to keep pace with an ever-expanding technology. It provides a multidisciplinary environment for innovative graduate teaching and substantial opportunities for research activities and public service under diversified sources of external support. The principal academic fields directly involved are operations research, mathematics, statistics, economics, and computer science.

The programs of the Institute are concerned with important educational and public-service needs for conservation of national resources. Such programs require full-time interaction among student, faculty, and staff in ways possible only at universities. Through its Program in Logistics, the Institute performs research leading to the development of a science of logistics featuring principles and methodology for resource allocation problems in civil affairs and national defense efforts. Other programs involve optimization, reliability, queuing, forecasting, and cost–benefit analyses.

Participation by faculty members and graduate students from all schools in the University is encouraged as consistent with the multidisciplinary objectives of the Institute. Qualified graduate students may obtain financial support through research assistantships, with thesis and dissertation efforts ordinarily being the major work responsibilities. Reliance is also placed on staff research specialists, and there are special provisions for substantial contributions from distinguished visitors from government, private industry, and other universities.

The Institute disseminates its results through seminars, colloquia, conferences, and a special series of monographs. All research is unclassified.

Institute for Reliability and Risk Analysis

The objective of the Institute for Reliability and Risk Analysis (IRRA) is to generate and promote basic and applied research in the mathematical and statistical aspects of reliability theory, risk analysis, quality control, and industrial statistics within the framework of a university environment. Achievement of this objective requires the participation and interaction of University faculty, visiting professors and scholars, scientists from government and industry, and doctoral-level graduate students.

Visiting professors and qualified graduate students may be supported through research grants, scholarships, and fellowships. The major effort of graduate students is in research toward the doctoral dissertation. In the past, major support for research at IRRA has come from the U.S. Army Research Office, the Office of Naval Research, the U.S. Nuclear Regulatory Commission, the Los Alamos Scientific Research Laboratories, and the U.S. Naval Air Systems Command as well as private industry, such as the Association of American Railroads and Ketron. IRRA is interested in developing more interaction with private industry and other government agencies that have needs that can be served by its activities. IRRA is also eager to attract visiting professors and scholars whose research objectives mesh with those of the Institute.

IRRA has been an active sponsor of seminars and colloquia, featuring distinguished scientists, for the general public and the university community and has issued technical papers and research reports to disseminate research results. It intends to continue this activity.

International Water Resources Institute

The International Water Resources Institute was created to foster a multidisciplinary approach to the planning, development, and operation of water resources systems and solutions to water resources problems on both the national and international levels.

The Institute emphasizes basic and applied research, technical development, transfer of knowledge, professional and scientific services, and special educational needs within the University and abroad.

The Institute supplies information to various government agencies and private concerns nationally and internationally and conducts seminars. It thus creates an international flow of knowledge about water resources problems and their possible solutions.

Institute for Information Science and Technology

The Institute for Information Science and Technology, of the Department of Electrical Engineering and Computer Science, provides a framework for the various research activities of the department and certain collaborative efforts. It brings together the strengths of electrical engineering and computer science and the social sciences, including law, education, government, psychology, political science, engineering, mathematics, geography, and others, in order to understand human–machine interactions and to understand appropriate designs for effective information systems for the future. The Institute relies on faculty and research contributors from the University as well as a broad range of other sources from government, industry, and academe. Visiting scholars

and fellows from government and industry fill important research positions while pursuing advanced studies.

The Institute is organized to conduct interdisciplinary educational programs by integrating mid-level scientists and managers into Institute research programs to provide them with greater insight into the latest research findings in the field of information science and technology. There is a deliberate mix of permanent and adjunct staff: government, industry, and university staff; practitioners and researchers; senior researchers and students—a cross-fertilization of the spectrum of skills and roles that can be brought to bear in the field of information science.

The increasing pace of technological innovation demands that universities and industry work together more closely than ever before. In recognition of this need, the **Industrial Liaison Program** has been established to develop closer cooperation and communication between the Department of Electrical Engineering and Computer Science, its Institute for Information Science and Technology, and those companies that depend on the technological foundations represented by the department. A steering committee of Washington area industrial leaders has provided important guidance in founding the program, which is structured to meet the needs both of the department and of industry. The following companies are current members of the Industrial Liaison Program: Apollo Computer; Communications Satellite Corporation; Computer Sciences Corporation; International Business Machines Corporation; National Engineering Laboratory of the National Bureau of Standards; MELPAR, Division of E-Systems, Inc.; The MITRE Corporation; Satellite Business Systems; Westinghouse Electric Corporation; and Fairchild Space & Electronics Company.

The Institute publishes an index of departmental reports and publications that are available to Industrial Liaison members on request. It conducts annually a review of departmental research activities.

Institute for Artificial Intelligence

The prospect of the fifth-generation computer, the advent of expert systems and robotics, and the interest in artificial intelligence being exhibited in all sectors of the government and economy combine to make research in artificial intelligence a timely undertaking. The Institute for Artificial Intelligence (IAI) was formed to unite, strengthen, and extend ongoing activities at the University, providing a focal point for those inside as well as outside GWU. In particular, the purpose of the IAI is to pursue an interdisciplinary approach to the research, development, testing, and evaluation of artificial intelligence aids to human endeavor in engineering and science, in manufacturing and industrial operations, and in policy and decision making. Ongoing research projects include cognitive modeling, intelligent interfaces, expert systems, computer-aided manufacturing, and automatic programming. Master's and doctoral degree concentrations in Artificial Intelligence and Human Factors are available.

The GWU/NASA–Langley Graduate Program

George Washington University, in cooperation with the National Aeronautics and Space Administration's Langley Research Center, has a full-resident

graduate engineering program at NASA–Langley in Hampton, Virginia, approximately 200 miles south of Washington, D.C.

The program is open to qualified NASA employees and area residents. Courses may also be taken by nondegree students, with the approval of the instructor. Students may be permitted to transfer a maximum of 6 semester hours of approved graduate course credit from other accredited institutions.

Courses in the program are taught by NASA scientists and engineers and the faculty of the School of Engineering and Applied Science. NASA–Langley's extensive scientific and engineering facilities and equipment are used whenever feasible.

The program at NASA–Langley leads to the degrees of Master of Science and Doctor of Science (by special permission of the appropriate department chairman) and to the professional degree of Engineer in the fields of acoustics, aeronautics, fluid mechanics and thermal sciences, solid mechanics and materials engineering, structures and dynamics, electrical engineering and computer science (M.S. degree only), and engineering administration (M.E.A. only).

Information regarding this program may be obtained from Professor John L. Whitesides, GWU/NASA Program, Mail Stop 269, NASA–Langley Research Center, Hampton, Va. 23665.

The GWU/NASA–Langley Joint Institute for Advancement of Flight Sciences (JIAFS)

The Joint Institute for Advancement of Flight Sciences was established in 1971 through the combined efforts of the National Aeronautics and Space Administration's Langley Research Center and the George Washington University's School of Engineering and Applied Science. The objective of the JIAFS program is to meet the nation's ever increasing needs in the advancement of science, engineering, and technology and to prepare qualified students for careers in research, development, design, and teaching. The Institute, located at the Langley Research Center in Hampton, Virginia, is dedicated to the advanced training of students and professional engineers in acoustics, aeronautics, structures and dynamics, and other relevant areas and serves to provide a center for advanced research by bringing together researchers and scholars from these fields for the exchange of ideas and findings. It is also the purpose of the Institute to provide the necessary facilities for qualified researchers and scholars who want to engage in research work in these areas.

The organization of the Institute consists of a director, Jerry C. South, Jr., Chief Scientist, NASA–Langley Research Center, and a co-director, Harold Liebowitz, Dean of the George Washington University's School of Engineering and Applied Science.

The education and research opportunities offered in the program combine the academic resources of George Washington University and the professional research assets and facilities of the NASA–Langley Research Center. These opportunities also enable students to involve themselves in research projects that excite their interest and permit them to associate with prominent visiting members working on related problems. Most of the faculty and NASA scientists conduct research, and students take part in the intimate association of research and instruction from the day of their arrival. It is believed that the experience of the students during their stay at NASA–Langley Research Center will be highly rewarding and beneficial.

The current education and research programs are the following.

Acoustics Program—This program is concerned with the problems of alleviating noise and with providing a technical base for design of acceptable aircraft and space vehicles, noise resistant structures, and ground transportation systems. Areas of research interest include boundary-layer noise, duct acoustics, jet noise, nonlinear problems in acoustics, structural response to noise, and mechanical and acoustical coupling problems.

Aeronautics Program—This program deals with advanced flight concepts of various types of aircraft, including areas of performance, flight dynamics, instrumentation, guidance and control, aeroelasticity, and systems analysis. Specific research areas currently being investigated include aerodynamic analysis of jet augmented wings, theoretical fluid mechanics, performance, stability and control of aircraft, wind tunnel and flight testing of aircraft, airfoil aerodynamics, stall-spin characteristics of aircraft, and experimental evaluation of aircraft handling characteristics.

Structures and Dynamics Program—This program is designed to provide basic understanding and working knowledge of key areas pertinent to structures, solid mechanics, and dynamics technology, including computer-aided design, optimum design of aircraft and of aerospace and other structures, and the dynamic and aeroelastic response of large and complex structures, particularly large space structures. Emphasis is placed not only on these individual areas but also on their interface and interaction.

Participating in these programs are Graduate Research Scholar Assistants, faculty from George Washington University, scientists and engineers from NASA–Langley, and visiting scientists and engineers.

A number of Research Scholar Assistantships are available to qualified students seeking an outstanding opportunity for graduate study and research leading to the degrees of Master of Science and Doctor of Science in the fields of acoustics, aeronautics, and structures and dynamics. Applicants who are awarded Research Scholar Assistantships receive stipends of $10,000 a year for a Master of Science degree and $11,000 a year for the Doctor of Science



degree. In addition, successful applicants receive full tuition remission. Applications, a JIAFS brochure, and additional information may be obtained from Professor John L. Whitesides, JIAFS–George Washington University, Mail Stop 269, NASA–Langley Research Center, Hampton, Va. 23665.

Honors Research Program

To provide individualized research experience to academically gifted undergraduate students, the School of Engineering and Applied Science has established an Honors Research Program. Students who maintain a grade-point average of 3.3 or above or are admitted to the School with a combined SAT score of 1250 and a rank in the upper 10% of their high school class are eligible to participate in this program. Students participate in an honors research seminar and work individually with a faculty member, performing a research project of mutual interest. Participation in the program earns 3 academic credits per semester; a minimum of 9 credits are needed to complete the program. Upon written request by the student, 6 of these credits may be used as technical electives.

The seminar includes discussion and presentation of results of the honors research projects, discussion of research techniques applicable to research in many disciplines, and discussion of conditions and trends that influence the performance and application of research in universities, industry, and government laboratories. The projects emphasize the performance of original research programs under the direct supervision of a faculty member. The research typically involves literature surveys, analytical and numerical studies, and/or the planning and execution of experiments. Students are expected to prepare written and oral reports on their research.

Qualified students interested in applying for the program should contact the Honors Research Chairman of the department in which the research is to be conducted.

Naval Reserve Officer Training Corps Program*

The Naval Reserve Officer Training Corps (NROTC) offers young men and women the opportunity to qualify for a full scholarship and a commission in the Navy or Marine Corps. NROTC midshipmen are required to complete the naval science courses and attend weekly laboratory sessions. During the summer, NROTC midshipmen participate in active duty at sea or on shore-based training cruises for approximately four weeks. Students may enroll in the NROTC program at the beginning of their freshman or junior year. Upon receiving the baccalaureate and completing the NROTC program, qualified midshipmen are commissioned as ensigns in the Navy or second lieutenants in the Marine Corps. Students may join the NROTC through any one of the following four programs.

Four-Year Scholarship Program—Students enter the NROTC Four-Year Scholarship Program through national competition and are appointed midshipmen in the Naval Reserve. While students are enrolled, the government provides tuition, fees, uniforms, and an allowance of $100 per month. Upon graduation, students are commissioned with an eight-year active/reserve service obligation and will serve on active duty for at least four years.

* For Army and Air Force ROTC program information, see pages 263–264.

Scholarship Program students must include courses in calculus, physics, technical electives, and naval science in their degree program and participate in three summer training periods of approximately four weeks each.

Two-Year Scholarship Program—Selection for this program is made through national competition, based on the student's academic record, physical qualifications, and an interview. Application should be made at the start of the spring semester of the student's second year. Selected applicants attend six weeks of instruction at the Naval Science Institute (NSI) at Newport, Rhode Island, during the summer before their third academic year. At NSI, students take courses in naval science, physical fitness, and in drill similar to that required of four-year NROTC students during their freshman and sophomore years. Successful completion of the NSI qualifies the two-year applicants for appointment as midshipmen in the Naval Reserve and enrollment in the NROTC Scholarship Program. Upon acceptance of this appointment, students receive all the benefits and assume all the obligations of midshipmen in the Four-Year Scholarship Program.

Four-Year College Program—Students are enrolled in the Four-Year College Program upon acceptance by the Department of Naval Science. Uniforms are provided, and during their junior and senior years, students receive $100 per month. Students must include courses in mathematics, science, and naval science in their degree program, attend the first class summer at-sea training period, accept a commission in the Naval Reserve or Marine Corps Reserve on graduation with an eight-year active/reserve service obligation, and serve on active duty after graduation for at least three years. After commissioning, application for transfer to the regular Navy or Marine Corps may be made. Midshipmen who complete one term as College Program students, have a satisfactory academic record, and are physically qualified may compete for a scholarship awarded by the Chief of Naval Education and Training.

Two-Year College Program—Application should be made at the start of the spring semester of the student's second year. Selections are made through the Department of Naval Science, based on the student's academic record, physical qualifications, and an interview. Those students selected will attend the NSI and upon successful completion may enroll in the program. The benefits and obligations are the same as those for the Four-Year College Program.

Requirements for All Candidates—Qualifications for acceptable candidates for the Scholarship Program or the College Program include U.S. citizenship, fulfillment of physical requirements, and willingness to participate in required summer training periods and to accept a commission in the Navy, Marine Corps, Naval Reserve, or Marine Corps Reserve when offered.

Enrollment in the NROTC is not a requirement for taking naval science courses. Any student enrolled at George Washington University may take naval science courses with the approval of the professor of naval science.

Naval Science Courses

51 Introduction to Naval Science (2)
Structure, principles, and practices; lines of command and control; logistical organizations; functions and services of major components of the Navy and Marine Corps; shipboard organization.

52 Naval Ships Systems I (3)
Types, structure, and purpose of naval ships; compartmentation, propulsion systems, auxiliary power systems, interior communications, ship control, ship design and stability.

125 Naval Ships Systems II (3)
Theory and principles of operation of naval weapons systems, including types of weapons and control systems, capabilities and limitations, theory of acquisition, identification and tracking, trajectory principles, and the basics of naval ordnance.

126 Sea Power and Maritime Affairs (2)
Sea power and maritime affairs; general concept of sea power (including Merchant Marine); role of naval warfare components used to support the Navy's mission; sea power as an instrument of national policy; comparative study of U.S. and Soviet strategies.

150 Navigation and Naval Operations I (3)
Theory, principles, and procedures of ship navigation. Topics include mathematical analysis, spherical triangulation, practical work involving sight reduction, sextants, publications, required logs/reports, piloting, celestial and electronic navigation techniques.

151 Navigation and Naval Operations II (3)
Principles and procedures of ship movement and employment, including tactical formations and dispositions, relative motion, communications, sonar–radar search and screening theory, rules of the road, lights, signals, and navigation aids.

160 Evolution of Warfare (3)
Historical development of warfare. Impact of major military theorists, strategists, tacticians, and technological developments. Strategy, military alternatives, and the impact of historical precedent on military thought and actions.

175 Naval Leadership I (3)
Principles of leadership and management. Development of skills in the areas of communications, counseling, control, direction, management, and leadership.

176 Naval Leadership II (2)
Human resource management, naval personnel management, material management, and the administration of discipline.

180 Amphibious Warfare (3)
Historical development of amphibious doctrine and conduct of amphibious operations. Emphasis on the evolution of amphibious warfare in the 20th century, especially during World War II. Present-day potential and limitations on amphibious operations, including the rapid deployment force concept.

Naval Science Course Credit

Students enrolled in undergraduate degree programs in the School of Engineering and Applied Science are eligible to receive technical elective credit for the successful completion of certain naval science courses.

Civil Engineering, Computer Science, and Mechanical Engineering majors:
- NS 52: Naval Ships Systems I
- NS 150: Navigation and Naval Operations I
- NS 175: Naval Leadership I

Electrical Engineering majors:
- NS 52: Naval Ships Systems I
- NS 150: Navigation and Naval Operations I

Systems Analysis and Engineering majors:

NS 52: Naval Ships Systems I
NS 125: Naval Ships Systems II
NS 150: Navigation and Naval Operations I
NS 151: Navigation and Naval Operations II
NS 175: Naval Leadership I (required course for SA&E majors; replaces EAd 150)

Social science credit may be received for the successful completion of the following naval science courses.*

NS 126: Sea Power and Maritime Affairs
NS 160: Evolution of Warfare
NS 180: Amphibious Warfare

Cooperative Education Program in Engineering

Cooperative education is a process of education that formally integrates the student's academic study with work experience in cooperating employer organizations. The usual plan is for the student to alternate periods of college study with periods of experience in appropriate fields of industry and government. The experience periods are considered an integral part of the student's education. Cooperative education students in a work assignment period are considered full-time students for purposes of housing and campus privileges. They are not considered as full-time students for Veterans Administration Benefits, financial aid, or visa purposes. Through the interaction of the study and work experiences, the student enhances academic knowledge, personal development, and professional preparation. The teaching faculty, the coordinators, and the employing supervisors share in the educational process of the cooperative student. The wages received as compensation for work performed under the Cooperative Education Program are taxable income per Section 61 of the IRS Code.

Advantages of Cooperative Education

Combines Theory and Practice—By coordinating the work experience in industrial and governmental organizations with the campus education program, theory and practice are closely integrated and students find greater relevance in their studies. As a result of this alternation between academic and industrial environments, students tend to understand the role and meaning of each environment, with a deeper appreciation for each.

Helps Finance Educational and Living Expenses—The students' earnings will contribute substantially to financing their education and living expenses, leading to independence and contributing significantly to self-esteem and confidence. Work experience usually increases in difficulty and responsibility as students progress through the academic curriculum, and salary increases accordingly.

Serves as a Bridge to the Future—Cooperative education helps markedly to orient students to the world of work. Most students are genuinely concerned about their future life work. They want to know more about the range of occupations open to them and the potentials and limitations of these fields.

* See *Undergraduate and Graduate Programs Bulletin* for further information.

They want to know about the qualifications demanded and their own fitness. Through cooperative education programs, students have opportunities for exploring their own abilities in connection with real jobs, and they find a direct means of gaining information and guidance not only in the occupations in which they are employed but in a number of related fields as well. They have a chance to test their own aptitudes more fully than is normally possible on campus.

Increases Motivation to Achieve—The coordination of work and study increases student motivation. As students see connections between jobs they hold and the things they are learning in school, greater interest in academic work develops. During the work periods there is a tendency for students to develop good work habits because their efforts as productive and salaried employees are rated by the employer.

Enhances Human Relationships—Because the work experiences involve the students in relations with co-workers who come from a variety of backgrounds, and because success in these jobs requires constructive relationships with colleagues, most students in cooperative education develop deeper understanding of other people and greater skills in human relations.

Augments Development of Maturity—For many students the work experience contributes to an increased sense of responsibility for their own efforts, more dependence on their own judgments, and a corresponding development of maturity. In addition, the students' roles as team members in a real and productive working environment inculcate a seriousness of purpose and toward life that is often delayed for the traditional college graduate.

Responsibilities of the Cooperative Student

The cooperative student working with professionals in the field must adopt professional standards of conduct. Such a student is also a representative of the George Washington University School of Engineering and Applied Science. After each work period the student prepares a report describing the duties and responsibilities at work, and the supervisor sends an appraisal of the student's work performance to the Cooperative Education Program coordinator. These reports are reviewed with the student.

The cooperative program is a three-way partnership among the student, the employer, and George Washington University. The student's responsibilities extend equally to each of the other two members of the partnership, and the partnership cannot be altered during the program without the knowledge and consent of all.

The cooperative student must maintain continuous enrollment in the School for each semester he or she is away from the School on a work period. Failure to do so breaks the student's registration, and he or she must apply for readmission to the undergraduate degree program under whatever conditions and regulations are in effect at that time.

Why Employers Participate in Cooperative Education Programs

Industry and government agencies have found that cooperative students are valuable employees. Generally speaking, they are alert and energetic young people who, stimulated by a definite goal, return more than a day's work for a day's pay. Graduates of the cooperative program represent a good source of well-trained manpower. The training period provides an opportunity for the

employer to evaluate the student as a prospective permanent employee. Employers feel that this program is an important part of their effort to attract well-qualified employees. At the same time, the student is able to evaluate the employer in terms of future plans and interests. About half of the cooperative graduates establish such mutually beneficial relationships with their employers that they remain in permanent employment after graduation, with a substantial head start in their careers.

It is emphasized, however, that neither the student nor the employer is obligated for permanent employment after graduation. Industry and government agencies consider participation in cooperative education as a long-range investment rather than a current expense. As a partner with the University, the employer is engaged in a joint effort to develop young talent more fully, thus assuring better education for the student, improved utilization of the graduate, and greater cooperation with the University.

Scholastic Requirements

Students entering the program must be in good academic standing and usually must have completed at least two semesters of college-level academic study prior to their first full-time work assignment. To remain in the program, the student must maintain a passing average and perform satisfactorily for the employer.

Living Accommodations

Arrangements are made for students in the cooperative program to retain their dormitory and dining privileges at the University, if they so desire, during the work periods. During this time, they also retain full student privileges and have access to all University facilities.

Work–Study Schedules

Individual student schedules are arranged with the various employers in Washington and other areas. Since each employer operates differently, special schedules are arranged that are mutually satisfactory to the student, the employer, and the School.

Generally, after the student has successfully completed the first year of study, a schedule is arranged with the employer. Many employers will require the student to work during the summer immediately following the freshman year. The student returns to the School for the sophomore year, working again during the second summer. Beginning with the third year, students alternate between employer and classroom each semester for the next two years, returning to the classroom for the fifth and final year. An alternate method is to work a full academic year and then return to school. Schedules for transfer students are arranged on an individual basis according to the number of semester hours transferred and the employer's requirements.

Tuition Aid

Under the Tuition Aid Program offered by certain employers, up to 50% of the cost of tuition, textbooks, and fees (exclusive of room and board) may be

granted. If tuition assistance is received, the cooperative student has to agr to serve as an employee after graduation for a period to be determined regulations in effect at that time. As a civil service employee, the co-op stude is eligible for many federal benefits, including annual leave, sick leave, pa holidays, health benefits, and life insurance.

Applications

Applications for the Cooperative Education Program from registered transfer students should be submitted at least 10 weeks prior to the beginnin of the first work period. It is recommended, however, that applications b submitted four months in advance of the work period. Transfer students wh meet admission requirements may apply for a work assignment during the summer or the semester just prior to their registration at this University.

Undergraduate 3:2 Dual-Degree Programs Combining Liberal Arts and Engineering

The School of Engineering and Applied Science has developed 3:2 Dual-Degree Programs in Liberal Arts and Engineering with the following accredited four-year degree granting institutions:

Bowie State College, Bowie, Md.
Chestnut Hill College, Philadelphia, Pa.
Gallaudet College, Washington, D.C.
Georgian Court College, Lakewood, N.J.
Hood College, Frederick, Md.
Mansfield State College, Mansfield, Pa.
Marywood College, Scranton, Pa.
St. Joseph's College, Hartford, Conn.
St. Mary's College, St. Mary's City, Md.
St. Thomas Aquinas College, Sparkhill, N.Y.
Virginia Commonwealth University, Richmond, Va.
Wheaton College, Norton, Mass.

These programs combine a basic liberal arts, math, and science education with a professional education in engineering in a unique, comprehensive learning experience.

Students initially enroll in the 3:2 Dual-Degree Program at one of the above institutions and pursue a three-year program covering social sciences, humanities, mathematics, physics, and chemistry, which helps the student develop broad cultural perspectives, analytic abilities, and communication skills.

After successful completion of the first phase of study, students then follow a two-year career program in engineering at the School of Engineering and Applied Science. During this phase of the study, students may specialize in any of the following areas of engineering, which are offered in George Washington University's regular four-year programs:

1. Civil Engineering
2. Computer Science
3. Electrical Engineering or Electrical Engineering with the following options: Computer Engineering, Premedical Engineering

4. Mechanical Engineering with one of the following options: Combustion and Environmental Engineering, Computer-Aided Design, Energy and Power, Fluid Mechanics and Thermal Sciences, Mechanical Engineering Design, and Solid Mechanics and Materials Engineering

5. Systems Analysis and Engineering with one of the following elective tracks: Computer Systems, Control and Instrumentation Systems, Electrical Energy Systems, Electromechanical Systems, Environmental Systems, Financial Systems, Management Decision Systems, Mathematical Systems, Mechanical Energy Systems, Network Systems, Naval Systems, Production Systems, and Statistical Systems

Upon successful completion of the two-year engineering program at George Washington University, students are awarded two baccalaureate degrees: a B.S. or B.A. from the first institution and a B.S. in engineering or computer science from George Washington University. At this point the student may choose to enter engineering practice, continue studies for advanced degrees, or enter other professional areas, such as law, medicine, or teaching.

Dual-Degree Program students are also eligible to apply for the Cooperative Education Program in Engineering at George Washington University (see pp. 55–58). The student transferring to George Washington University will have completed the equivalent of two years of engineering. Thus the student would have the option of working during the summer and starting classes in the fall or working for a full eight months prior to starting classes. Dual-Degree Program students interested in applying for cooperative education at George Washington University should submit the appropriate application forms six months prior to actual transfer.

For further information on the 3:2 Dual-Degree Programs, contact the Admissions Office of the institutions listed above or Manager, Engineering Admissions, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052, (202)676-6158.

Continuing Engineering Education Program

Today most engineers and their employers are well aware of the rapid advances of knowledge in science and technology. The inability to understand and to make timely applications of new technologies can mean both personal and corporate failure. To prevent this potential obsolescence, engineers must involve themselves in a continuing program of technical reading and organized learning.

The School of Engineering and Applied Science meets this need with a comprehensive program of noncredit courses. The program's objective is to increase the competence of practicing engineers rather than to grant further academic degrees. Staff reorganizations require many engineers to change their specialties or to take on additional duties within their present jobs. Continuing engineering education can provide the education and skills the engineer needs to effectively make these changes. Continuing engineering education also aids in qualifying for promotions and in maintaining certification in certain professional fields.

The program will present over 500 noncredit courses this year. About half of them last for five days (30 classroom hours); others are for two, three, or four

days. Presentation of theory is often augmented by workshops to give regi trants practice in the specific discipline. All courses stress practical applica tions. Students from all over the nation and from many foreign countries hav participated in courses. The variety of experience and background of thes students enriches the classroom discussions.

In 1976 and 1978 courses were presented in Europe to test the acceptabi ity of this approach to education by the scientific and engineering commun ties. The very favorable response resulted in an expanded schedule, with classes now held regularly in London, Amsterdam, Munich, and Berlin. In 1981 the program presented in the United States was extended to Mexico and Canada.

Courses that have been presented in the Continuing Engineering Educa tion Program include the following:

Computers and Information Processing

Advanced Records Management
Algorithm Design
An Applications-Oriented Approach to Artificial Intelligence
CAI: A Systems Approach to Program Design
Computer Graphics Systems: Design and Applications
Computer Performance Evaluation
Configuration Management of Software Programs
DATAPLOT: A Language for Graphics
Desktop, Personal, or Small Business Computer
Developing and Implementing CAI Programs
Distributed Processing
Electronic Computer Printing
Graphical Data Analysis
Hands-on PASCAL Computer Programming
High-Level Decision Making
Human Factors in Computer Graphics
Intelligent Robots
Interactive Computer-Based Systems Design
Local Area Computer Networks
Mathematical Software
Microcomputers in Control Systems
Microprocessors and Microcomputers
Military Software Development: MilStd 1679
Minicomputers, Microcomputers, and Microprocessors for Non-electrical Engineers
Principles of Analysis
Programming in the C and UNIX* Environment
Records Management
Software Engineering and Quality Assurance
Software Quality Assurance
Super Micros: The New 32-Bit Microprocessors
Systems Analysis Techniques for Information Managers
Workshop in Data Communications for Microcomputers

Communications

Advanced Cable Technology
Cellular Radio Telecommunication
Communication Satellite Engineering
Communication Satellite Systems
Communications ECM Principles and Techniques
Data Communication Standards
Data Communication Systems and Networks
Digital Communication and Computer Network Systems

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Digital Telephony
Digital Transmission Systems Engineering
Direct Broadcast Satellite System Design
Distributed Telecommunication Networks
DOD Aerospace C^3I Perspectives
Electromagnetic Interference and Control
Fiber and Integrated Optics
Fiber Optic System Design for Military Applications
Foundations of Modern Telecommunication Systems
Frequency Synthesis
Fundamentals of Communication Satellite Systems
Fundamentals of Data Communications
Global Positioning System Principles and Practices
Internet Systems and Protocols
Local Area and Integrated Services and Digital Networks
Magnetic Recording Engineering
Mobile Cellular Telecommunication Systems
Mobil Communications Engineering
Modern Communications and Signal Processing
Modern Data Communications
Modern Receiver Design
Multi-user Communication Systems and Networks
Principles of Switching
Principles of Transmission
Spread-Spectrum Communication Systems
Strategies for Planning Telecommunication Networks
Synchronization of Spread-Spectrum Communications
Telecommunication Alternatives in the '80s
Telecommunications Traffic Engineering
Video Teleconferencing
Vulnerability of Spread-Spectrum Communication Systems
Wideband Communication Systems

Civil Engineering/Transportation/ Construction

Applying and Implementing Industrial Robots
Elements of Railway Signaling and Control Systems
Fibrous Composite Structures
Finite Element Analysis and Computer Graphics
Highway Bridges: Inspecting, Rating, and Upgrading
Railway Bridges: Inspecting, Rating, and Upgrading
Recent Advances in Fracture and Fatigue

Electrical and Electronics Engineering

Advanced Geological Remote Sensing
Advanced Radar Technology
Advances in Digital Signal Processing
Advances in Electronics Technology I and II
Antennas and Arrays
Application and Control of Electric Motors
Applied ECM
Applying Remote Sensing to the Marine Environment
Design and Evaluation of Electronic Scanning Radar
Digital Electronics and ICs for Non-Electrical Engineers
Digital Geographic Information Systems
Digital Image Processing and Applications
Digital Signal Processing
Electrical Equipment Testing and Maintenance
Electromagnetic Interference and Control
Electromagnetic Pulse
Electronic Corrosion Prevention and Control
Electronic Warfare and Surveillance
Electronic Warfare Systems
Electro-Optics, Fiber Optics, and Lasers for Non-Electrical Engineers

ELINT: Analyzing Radar Signals
Fiber-Optic System Design
Fiber-Optic Technology for Communications
Frequency Synthesizers
Grounding, Bonding, and Shielding
Hazardous Radio Frequency (RF) Electromagnetic Radiation
High-Frequency Spectrum
Integrated Circuit Engineering
Introduction to Command, Control, and Communications
Introduction to Lasers and Their Industrial Applications
Introduction to Modern Radar Technology
Lightning Protection
Microelectronic Interconnection and Packaging
Microwave High-Power Tubes and Transmitters
Microwave System Planning
Millimeter-Wave Radar
Modern Air-to-Air Radar Systems
Monopulse Radar Principles and Techniques
Packet Switching for Modern Data Communications
Principles of Radar
Protective Relaying and Switchgear Controls
Public and Private Packet Switched Networks
Radar ECCM
Radar Missile System ECCM
Radar Principles for the Nonspecialist
Radar Signal Processing and Automatic Detection
Radar Systems and Technology
Radiowave Propagation for Communication System Design
Remote Sensing for Global Resource Applications
Semiconductor Device Technology
Solid-State Electronics for Non-Electrical Engineers
Sonar System Design and Prediction
Synthetic Aperture Radar
Tactical Missile System Guidance and Control
TDMA Satellite System Engineering

Engineering Management

Advanced Project Management
Algorithm Design for Managers a
Entry-Level Programmers
Concepts and Applications for Pr
gram Management
Configuration Management
Fundamentals of Management fo
Engineers and Managers
Matrix Management
Practical Project Management
The Technical Manager
Warehousing Improved Efficienc
Through Automation

Medical Engineering

Hospital System Safety Engineering
Medical Instrumentation
Microcomputers in Medical Instrumentation
Planning and Implementing an
NMR Imaging Facility
Spectrum Management

Statistics/Quality Assurance/ Reliability/Operations Research Systems Analysis

Bayesian Methods in Reliability and Quality
Bayesian Statistics for Scientists
Damage Tolerance Analysis of Aircraft Structures
Implementing Statistical Control Methods
Japanese Methods for Productivity and Quality
Life Cycle Cost Analysis
Life-Testing and Burn-in Techniques
Quality Engineering
Statistical Computing Packages
Techniques for Standards and Calibrations Laboratories
The Japanese Correction: Statistical Methods for Quality

Industrial Engineering

Cogeneration Systems: Engineering and Legal Aspects
Industrial Automation and Robotics
Metal Stamping, Casting, and Machining

Planning and Scheduling of Maintenance
Ventilation Design for Industrial Applications
Warehousing/Distribution Operations Using Computers
Welding Engineering

Mechanical Engineering

Introduction to Hydraulic Servo Systems
Microcomputer Control of Hydraulic Systems
Resistance and Propulsion of Ships
Seakeeping Performance of Marine Vehicles

Energy and Environmental Systems

Coal Geoscience: Practical Factors and Applications

Aerospace and Aeronautical Engineering

Satellite Systems for Navigation, Control, and Surveillance

Chemical Engineering

Plastics Degradation
Methods of Analysis for Plastics Degradation

New courses are developed as needs become apparent in various fields, and repeated courses are continuously revised. Over 110 new courses were added last year.

In addition to the faculty of the School of Engineering and Applied Science, outstanding lecturers and instructors from other universities, from industry, and from government laboratories and agencies serve on the instructional staff of the program.

The program also offers noncredit contract courses off campus specifically tailored for the needs and backgrounds of the engineers employed by a company or agency. Tuition for these courses is usually slightly lower than for those offered at the University.

To receive announcements or additional information on the program, write to Continuing Engineering Education Program, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052, or call (202)676-6106 or (800)424-9773.



Administration

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Harold Liebowitz *(Chairman)*, E. Della Torre, R.R. Fox, N.D. Singpurwalla

Advisory Council*

The purposes of the Advisory Council for the School of Engineering and Applied Science are to strengthen communication between the School and the other colleges, schools, and divisions of the University as well as between the School and the University's Board of Trustees; to advise on the programs of instruction, research, and service in the School and to help interpret these programs to the community and the nation; and to stimulate support for the continued development of the School and its programs.

Members of the Council for 1985–86

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Bruno A. Boley, *Dean, Technological Institute, Northwestern University*

George M. Bunker *(University Trustee), Washington, D.C.*

J.P. Chambers, *Vice President, Domestic Customer Relations, E-Systems, Inc.*

L. Stanley Crane *(University Trustee), Chairman and Chief Executive Officer, Consolidated Rail Corporation*

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Eugene G. Fubini, *Engineering Consultant*

Martin Goland, *President, Southwest Research Institute*

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Alexander Hassan, *Washington, D.C.*

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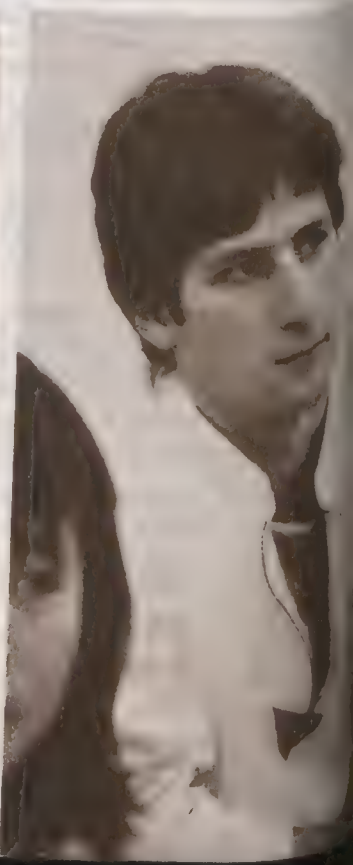
Harold A. Wheeler, *Chief Scientist and Chairman Emeritus, Hazeltine Corporation*

L.A. Zadeh, *Professor of Electrical Engineering and Computer Sciences, University of California, Berkeley*

*The President of the University, the Vice President for Academic Affairs, and the Dean of the School of Engineering and Applied Science are *ex officio* members of the Advisory Council.








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CHARLES E. SMITH CENTER



Programs of Study and Courses of Instruction

Programs of study, curricula, and courses of instruction offered by the School of Engineering and Applied Science are described in this section.

Students who are not candidates for degrees but who wish to take courses offered by the School should apply for admission to the Division of Continuing Education and Summer Sessions.

Explanation of Course Numbers

Courses numbered 1–200 are planned for undergraduate credit, although certain courses may be taken for graduate credit when arrangements are approved in advance by the instructor and the Dean. Courses numbered 201–300 are planned for graduate credit and may in certain instances be taken by qualified undergraduate students. Courses numbered 301–400 are primarily for doctoral students.

Semester Hours of Credit

The number of semester hours of credit given for the satisfactory completion of a course is indicated in parentheses after the name of the course. A year course giving three hours of credit each semester is marked (3–3) and a semester course giving three hours of credit is marked (3). A semester hour consists of the completion of one 50-minute period of class work or of one laboratory period a week for one semester.

Time of Course Offerings

Following each course description is a parenthetical statement giving the semester for which the course is scheduled to be offered. The term "academic year" is used only with two-semester courses and indicates that the first half of the course is to be offered in the fall semester and the second half in the spring semester; the term "as arranged" is used for courses that could not be scheduled at the time of printing this catalogue. Offerings for the summer sessions are not designated in this catalogue. Students should consult the *Summer Sessions Schedule of Classes* for summer offerings. A *Schedule of Classes* is also published for each fall and spring semester, providing up-to-date information concerning the time of course offerings.

Computer Usage Fee

On those courses that use the computer facilities of the University, a computer usage fee will be assessed. The fee is $50 per course, but no student will be charged more than $100 per semester for computer use. Courses on which a computer usage fee is to be assessed will be announced in the *Schedule of Classes*.

Key to Abbreviations

The following abbreviations for course designations are used by George Washington University.

Acct	Accountancy
AdSc	Administrative Sciences
AHA	Allied Health Administration
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
BAd	Business Administration
Bioc	Biochemistry
BiSc	Biological Sciences
Cart	Cartography
CE	Civil Engineering
CH&D	Child Health and Development
Chem	Chemistry
Chin	Chinese
Clas	Classics
ClEn	Clinical Engineering
CmTr	Communication and Theatre
CpMd	Computer Medicine
CSci	Computer Science
Derm	Dermatology
EAd	Engineering Administration
Econ	Economics
Educ	Education
EE	Electrical Engineering
EFL	English as a Foreign Language
EMed	Emergency Medicine
Engl	English
EngS	Engineering Science
EnHe	Environmental Health
Envr	Environmental Studies
EPol	Education Policy
E&RP	Environmental and Resource Policy
ForS	Forensic Sciences
Fren	French
Geog	Geography and Regional Science
Geol	Geology
Ger	Germanic Languages and Literatures
Gern	Gerontology
Gnet	Genetics
HCS	Health Care Sciences
Hist	History
HKLS	Human Kinetics and Leisure Studies
Hmn	Humanities
HSA	Health Services Administration
Idis	Interdisciplinary Courses
Ital	Italian
Japn	Japanese
Jour	Journalism
Kor	Korean
Law	Law
LEnf	Law Enforcement
Libr	Library
Math	Mathematics
ME	Mechanical Engineering
Med	Medicine
Mgt	Management Science
Micr	Microbiology
MStd	Museum Studies
Mus	Music
Neur	Neurology
NSc	Naval Science
NSur	Neurological Surgery
Ob&G	Obstetrics and Gynecology
Opht	Ophthalmology
OR	Operations Research
Orth	Orthopedic Surgery
PAd	Public Administration
Path	Pathology
Pchi	Psychiatry and Behavioral Sciences
PCm	Political Communications
Phar	Pharmacology
Phil	Philosophy
Phyl	Physiology
Phys	Physics
Port	Portuguese
PPol	Public Policy
PSc	Political Science
Psyc	Psychology
Rad	Radiology
Rel	Religion
RSci	Radiological Sciences
Slav	Slavic Languages and Literatures
SLP	Service Learning Program
Soc	Sociology
Span	Spanish
SpEd	Special Education
SpHr	Speech and Hearing
Stat	Statistics/Computer and Information Systems
Surg	Surgery
TCom	Telecommunication Policy
T&T	Travel and Tourism
Univ	University
Urol	Urology
U&RP	Urban and Regional Planning
WStu	Women's Studies

Applied Science

Interdepartmental offerings.

Undergraduate Courses

57 Analytical Mechanics I (2)
First half of a one-year sequence. Concepts of statics: force systems, equilibrium conditions, simple structures, distributed forces, shear and moments, friction and the concept of work, virtual work and stability. Prerequisite or concurrent registration: ApSc 113, Phys 14. (Fall and Spring)

58 Analytical Mechanics II (3)
Second half of a one-year sequence. Concepts of dynamics: kinematics of particles, velocity and acceleration, Newton's laws of motion, momentum, work, kinetic energy, potential energy, central force fields, vibrations, resonance, dynamics of systems of particles, kinematics of a rigid body, dynamics of a rigid body. Prerequisite: ApSc 57. (Fall and Spring)

113 Engineering Analysis I (3)
Analytical methods appropriate to the solution of engineering problems: applications of ordinary differential equations, matrices and determinants, eigenvalues and eigenvectors, systems of ordinary linear differential equations, Bessel and Legendre functions. Prerequisite or concurrent registration: Math 33. (Fall and Spring)

114 Engineering Analysis II (3)
Analytical methods appropriate to the solution of engineering problems: complex variables, Fourier series and integral, orthogonal functions, Laplace transforms, partial differential equations in engineering and applied science. Prerequisite: ApSc 113 (Fall and Spring)

115 Engineering Analysis III (3)
Analytical methods appropriate to the solution of engineering problems using concepts from probability and statistics: random variables, distribution functions, mathematical expectation, point and confidence interval estimation, hypothesis testing, correlation, regression, and engineering applications. Prerequisite: Math 32. (Fall and Spring)

116 Engineering Analysis IV (3)
Analytical methods appropriate to the solution of engineering problems using advanced concepts from probability and statistics: multivariate distributions, expectation, generating functions, parametric families of distributions, sampling and sufficient statistics, estimation, hypothesis testing, statistical decision theory, and engineering applications. Prerequisite: ApSc 115 and Math 33. (Fall and Spring)

199 Honors Research Project and Seminar (3)
Student designs and carries out a research project under close supervision of a faculty adviser. Students from all engineering disciplines meet periodically to present projects and discuss results. Enrollment limited to students admitted to the Undergraduate Honors Research Program. May be repeated for credit.

Graduate Courses

211 **Analytical Methods in Engineering I** (3)
Engineering applications of the theory of complex variables: contour integration, conformal mapping, inversion integral, and boundary–value problems. Prerequisite: approval of Department. (Fall and Spring)

212 **Analytical Methods in Engineering II** (3)
Analytical methods appropriate to the formulation of engineering problems: finite dimensional vector spaces, eigenvalue problems, generalized Fourier series, tensor calculus, curvilinear coordinates. Prerequisite: approval of Department. (Fall)

213 **Analytical Methods in Engineering III** (3)
Analytical techniques for solution of boundary–initial value problems in engineering: wave propagation, diffusion processes, and potential distributions. Prerequisite: approval of Department. (Fall and Spring)

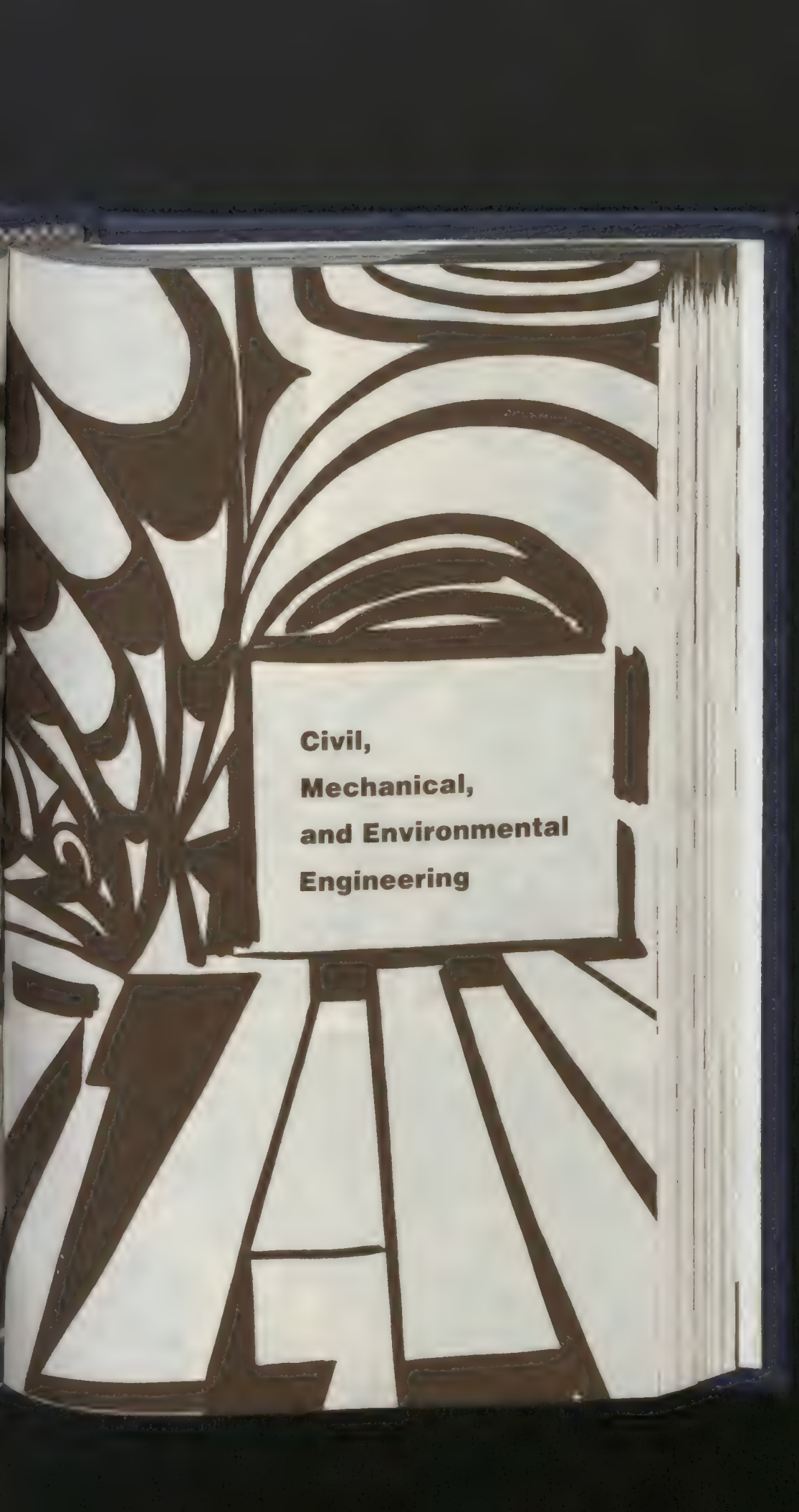
214 **Analytical Methods in Engineering IV** (3)
Introduction to variational methods in engineering: Ritz and Galerkin approximation methods of boundary–value problems, aspects of linear integral equations arising from engineering analysis. Prerequisite: approval of Department. (Spring, odd years)

215 **Analytical Methods in Engineering V** (3)
Advanced methods of solution of boundary–initial value problems in engineering: characteristics, wave propagation, and Green's functions. Prerequisite: ApSc 213. (Fall, odd years)

216 **Special Topics in Engineering Analysis** (3)
Selected topics such as: perturbation techniques applied to approximate solution of nonlinear boundary and initial value problems in engineering; application of singular integral equations in problems of mechanics; applications of elements of functional analysis in engineering and science. Prerequisite: approval of Department. (Spring, even years)






Civil,
Mechanical,
and Environmental
Engineering





Civil, Mechanical, and Environmental Engineering

Professors G.M. Arkilic, R.R. Fox *(Chairman)*, H. Liebowitz, S.W. Yuan, J.F. Feir, T.G. Toridis, J.P. Campbell *(Research)*, J. Eftis, A.K. Noor, R. Goulard, A.B. Cambel, K. Mahmood, A.M. Kiper, M.K. Myers, J.-N. Yang, R.E. Kaufman, V. Yevjevich *(Research)*, D.M. Esterling, C.M. Gilmore, J.L. Whitesides, Jr., T.P.G. Liverman, V. Klein *(Research)*, D.L. Jones, B.A. Bell

Adjunct Professors R.M. Sorensen, W.P. Reid, M.P. Gaus, B.W. Hannah, B. Whang, M. Soliman, E. Van Reuth

Professorial Lecturers M.S. Ojalvo, R.E. Fulton, L.K. Loftin, Jr., M. Yachnis, N.L. Basdekas, D.R. Levin, W. Viessman, Jr., W.D. Erickson, J.A. Belding, Jr., G.D. Love, S.-C. Liu, D.D. Moran, T.-F. Zien, H. Goldsmith, A.L. Kotb, D.J. Michel, J.R. Weggel, G. Banerian, W.L. Harris, W.D. Jackson, H.H. Landon, B. Miller, E.F. Skelton, C.J. Astill, W.H. Huang, P.D. Maycock, M.J. Queijo, J.C. Hardin, R.H. Tolson, J. Sobieski, D.U. Gubser, J.J. Bregman, P. Patil, E. McCafferty, R.C. Macon, S.K. Park, H.S. Gill, M. Bayazit, P.S. Lam, H.H. Vanderveldt, E.C. Yates, Jr., R.M. Brown, C. Ng

Associate Professors C.A. Garris, P.K. Poulose *(Research)*

Adjunct Associate Professor M.O. Critchfield

Associate Professorial Lecturers R.W. Fralich, H.A. Leybold, J.C. Yu, D.W. Ellison, B.R. Barkstrom, R.Y.-Y. Ting, P.L. Coe, Jr., M.C. Cullingford, R.D. McConnell, D.R. Tenney, A.M. Yen, R.S. Polvani, E.R. Long, Jr., A. Kehnemui, F. Farassat, F.L. Willingham, Jr., D.W. Coder, S.T. Hwang, M.S. Nataraja, L.-S. Pan, A.B. Wardlow, Jr., C. Wu, C.J. Jachimowski, M.M. Mikulas, Jr., J.C. Coolbaugh, K. Khozeimeh, L.D. Pinson, R.L. Bowles, J.A. Sprague, D. Glasgow, W.D. Burrows, G.C. Everstine, V. Mukhopadhyay, C. Winklehaus, W.J. Boettinger, M.I. Haque, M.S. Anderson, B. Dendrou, R.F. Jones, Jr., S.C. Mehrotra, T. Wells, D.R. Mulville, D.L. Dwoyer, S. Basu, R.W. Barnwell, R.J. Margason, I.S. Raju

Adjunct Assistant Professor M.A. Imam

Assistant Professorial Lecturers R.C. Montgomery, J.N. Shoosmith, G.D. Walberg, R. Lee, B.A. Stein, H.L. Beach, Jr., R.L. Swanson, K. Sutton, T.L. Walton, Jr., M.Y. Hussaini, G.E. Hicho, J.F. O'Dea, S.L. Zimmerman, P.J. Emmerman, M.P. Gottlieb, W. Kulyk, J.N. Moss, L.W. Townsend, E.T. Von Briesen, A. Pue, R. Lindberg, Jr.

Lecturer P.G. Chesler

Civil Engineering Undergraduate Study

Civil engineering encompasses those branches of engineering activities most closely related to the control and improvement of our environment and of the conditions of life. Study in this field prepares students for careers in the planning, design, and construction of: buildings; bridges; roads; airports; rapid transportation systems; harbors; off-shore facilities; coastal protection structures; flood and pollution control systems for rivers, estuaries, and lakes; inland navigation systems; large power generation and flood control dams; water resources projects; urban renewal and development projects; and pollution control and waste disposal projects. It also provides the scientific and technological background required for careers in municipal engineering, urban and regional planning, and environmental and geotechnical civil

engineering and for careers in engineering research in structural mechanics, ocean engineering, and materials engineering.

The curriculum provides the essentials for beginning a career upon graduation, for registration as a professional civil engineer as required by law, and for continuing study at the graduate level.

Part-Time Study

In response to requests from individuals employed full time in the Washington, D.C., area who wish to obtain a Bachelor of Science degree in Civil Engineering in a reasonable period of time, evening or late afternoon classes in the Civil Engineering curriculum are scheduled on a regular basis. For example, if a part-time student enrolls for three courses a semester, B.S. degree requirements can be completed in less than 15 semesters.

Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

First Semester

CSci 51: Applications of Computers (3)
Math 31: Single-Variable Calculus I (3)
Phys 13: General Physics for Engineering and Applied Science (3)
Engl 9 or 10: English Composition: Language as Communication (3)
Elective: Selected from humanities or social sciences (3)

Second Semester

EngS 4: Descriptive Geometry and Drafting (3)
Math 32: Single-Variable Calculus II (3)
Phys 14: Mechanics and Thermal Physics (3)
Chem 13: General Chemistry (4)
Elective: Selected from humanities or social sciences (3)

Third Semester

Math 33: Multivariable Calculus (3)
Phys 15: Electricity and Magnetism (3)
ApSc 57: Analytical Mechanics I (2)
ApSc 113: Engineering Analysis I (3)
ApSc 115: Engineering Analysis III (3)
Elective: Selected from humanities or social sciences (3)

Fourth Semester

Phys 16: Modern Physics (3)
ApSc 58: Analytical Mechanics II (3)
ApSc 114: Engineering Analysis II (3)
CE 120: Introduction to the Mechanics of Solids (3)
CE 140: Materials Science (3)

Civil Engineering Curriculum

Fifth Semester

CE 121: Structural Theory I (3)
CE 166: Materials Engineering (2)
CE 167: Mechanics of Materials Laboratory (1)
ME 126: Fluid Mechanics (3)
ME 131: Thermodynamics (3)
Elective: Selected from humanities or social sciences (3)

Sixth Semester

CE 122: Structural Theory II (3)
CE 192: Reinforced Concrete Structures (3)
CE 193: Hydraulics (3)
Geol 136: Engineering Geology (3)
Elective: Selected from humanities or social sciences (6)

Seventh Semester

CE 168: Introductory Soil Mechanics (3)
CE 190: Contracts and Specifications (2)
CE 191: Metal Structures (3)
CE 194: Environmental Engineering I: Water Supply and Resources (3)
CE 195: Hydrology (3)
Elective: Technical elective (3)

Eighth Semester

CE 182: Foundation Engineering (2)
CE 185: Soil Mechanics and Foundation Engineering Laboratory (1)
CE 196: Design and Cost Analysis of Civil Engineering Structures (3)
CE 197: Environmental Engineering II: Waste and Pollution Control (3)
Elective: Technical electives (8)*

Technical Electives

ApSc 199: Honors Research Project and Seminar (3)
CE 198: Research (3)
CE 201: Design of Metal Structures (3)
CE 202: Design of Reinforced Concrete Structures (3)
CE 203: Prestressed Concrete Structures (3)
CE 204: Applied Soil Mechanics I (3)
CE 206: Geotechnical Engineering (3)
CE 208: Rock Engineering (3)
CE 210: Methods of Structural Analysis (3)
CE 212: Open Channel Flow (3)
CE 213: Hydraulic Structures (3)
CE 214: Design of Dams (3)
CE 215: Urban Construction Technology (3)
CE 216: Advanced Hydrology (3)
CE 220: Urban Transportation Engineering (3)

*EAd 160 *Introduction to Engineering Economic Analysis* is a strongly recommended technical elective.

CE 222: Stations and Terminals (3)
CE 223: Traffic Engineering (3)
CE 240: Principles of Environmental Engineering I (3)
CE 241: Principles of Environmental Engineering II (3)
CE 243: Environmental Impact Assessment (3)
CE 253: Failure and Reliability Analysis of Engineering Structures (3)
CE 255: Introduction to Ocean and Coastal Engineering (3)
CE 266: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I (3)
CE 282: Hydraulic Modeling (3)
EAd 160: Introduction to Engineering Economic Analysis (3)*
EngS 215: Advanced Strength of Materials (3)
EngS 231: Structure of Materials (3)
EngS 234: Composite Materials (3)
EngS 237: Environmental Effects on Materials (3)
EngS 241: Failure of Materials (3)
EngS 242: Materials Recycling and Recovery (3)
EngS 282: Computer-Aided Design (3)
EngS 284: Numerical Methods in Engineering (3)

Civil Engineering Undergraduate Courses

120 **Introduction to the Mechanics of Solids** (3)
Stress and strain; axial load problems; torsion; shear force and bending moment; pure bending of beams; shearing stresses in beams; compound stresses; analysis of plane stress and plane strain; combined stresses; deflection of beams; statically indeterminate problems; columns; the energy methods. Prerequisite: ApSc 57, 113. (Fall and Spring)

121–22 **Structural Theory I–II** (3–3)
Theory of determinate and indeterminate structures using both classical and modern approaches. Prerequisite or concurrent registration: CE 120. (Fall and Spring)

140 **Materials Science** (3)
Electron structure of atoms; atomic and molecular bonding; energy bands; crystal structure; imperfections; noncrystalline solids; reaction rates; diffusion; phase transformations, mechanical properties, electrical conduction; metals, insulators, semiconductors; magnetism; optical properties. Prerequisite: Chem 13; concurrent registration: Phys 16. (Fall and Spring)

166 **Materials Engineering** (2)
Mechanical properties, plastic deformation dislocation theory, yielding, strengthening mechanisms, microstructure and properties, heat treatment of steel, composites, amorphous materials, visco-elastic deformation, creep, fracture, fatigue, fatigue crack propagation. Prerequisite: CE 140; concurrent registration: CE 120. (Fall and Spring)

167 **Mechanics of Materials Laboratory** (1)
Measurement of strains and study of failure resulting from applied forces in ductile, brittle, anisotropic, elastomeric, plastic, and composite materials. Study of tension, compression, bending, impact, and shear failures. Prerequisite or concurrent registration: CE 166. (Fall and Spring)

168 **Introductory Soil Mechanics** (3)
Engineering properties of soils; analysis of lateral earth pressures, bearing capacity, foundations, and slope stability. Prerequisite: CE 120, ME 126. (Fall)

*Strongly recommended technical elective.

182 Foundation Engineering (2)
Subsurface exploration, design of shallow foundations, design of pile foundations, earth-retaining structures, professional ethics applications. Prerequisite: CE 168. (Spring)

185 Soil Mechanics and Foundation Engineering Laboratory (1)
Laboratory experiments for the classification, strength, compressibility, and general engineering properties of soils. Prerequisite: CE 168. (Spring)

190 Contracts and Specifications (2)
Law of contracts; construction contracts; specifications; bidding; insurance and bonds; professional liability; arbitration of disputes; litigation. (Fall)

191 Metal Structures (3)
Principles of the design of metal structures; structural elements; connections; specific problems of analysis; methods of construction; professionalism in design. Prerequisite: CE 122. (Fall)

192 Reinforced Concrete Structures (3)
Principles of the design of reinforced concrete structures. Details of reinforcement of structural elements. Monolithic structures, precast elements, methods of construction. Prerequisite: CE 121; or concurrent registration: CE 122. (Spring)

193 Hydraulics (3)
Fluid statics: applications to calculation of boundary forces in a static fluid buoyancy, and flotation. Application of kinematic principles; flow fields, stream tubes, and flow nets. Fluid dynamics: applications to pipe flow, hydraulic models, measurement of pressure, and velocity. Open channel flow: applications to water resources engineering. Prerequisite: ME 126. (Spring)

194 Environmental Engineering I: Water Supply and Resources (3)
Planning and design of water supply and waste-water disposal systems. Water quality control and treatment processes. Desalination, stream pollution control. Prerequisite or concurrent registration: CE 193. (Fall)

195 Hydrology (3)
Descriptive hydrology: hydrologic cycle, precipitation, stream flow, evaporation, and transpiration. Quantitative hydrology: hydrograph analysis, estimating volume of runoff, runoff from snow, hydrographs of basin outflow, storage routing. Probability concepts in hydrology: flood frequency, rainfall frequency, drought, stochastic hydrology. Prerequisite or concurrent registration: ApSc 115, ME 126, CE 193. (Fall)

196 Design and Cost Analysis of Civil Engineering Structures (3)
Total structural systems concepts. Design of civil engineering structures such as piers, wharves, bulkheads, offshore platforms, dams, and other special structures. Principles of cost analysis for timber, steel, and reinforced concrete structures. Prerequisite: senior status. (Spring)

197 Environmental Engineering II: Waste and Pollution Control (3)
Disposal of sewage, biological treatment, chemical treatment, filtration, activated sludge, sludge handling and disposal. Control of industrial wastes and of nuclear waste products. Solid waste disposal. Prerequisite: CE 193. (Spring)

198 Research (1 to 3)
Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and Spring)

Mechanical Engineering Undergraduate Study

Mechanical engineering is primarily concerned with physical systems in motion. A mechanical engineer is concerned with the conversion, transfer, and control of energy from its source to its moving system. Land and marine vehicles, transportation systems, air-conditioning systems, nuclear reactors and fuel cells, low-pollution control devices, synthetic fuels, energy resources and the means of practical and economical conversion of the various forms of energy to mechanical and electrical power, and a host of other devices lie in this domain. Training in this area should provide the ability to formulate problems based on fundamental laws of nature, to recognize the types of methods applicable to their solution, to read with understanding the relevant work, and to come up with a usable answer. The mechanical engineering curriculum provides a background for careers in research, design, development, and manufacturing in a wide variety of industries.

Course offerings in mechanical engineering, which begin with a broad foundation in physics, chemistry, mathematics, humanities, and social sciences, consist of studies in basic mechanics of solids and fluids, electricity and electronics, materials sciences, dynamic analysis, thermal sciences, energy conversion and power, environmental control, and the design of machines and systems and their control. Because of the increasing emphasis on the application of computers in mechanical engineering, the curriculum incorporates computer applications in a wide variety of courses. These applications include computer-aided drafting, analysis of mechanical system components, optimization of mechanical engineering systems, and laboratory data collection and reduction. Technical electives in the senior year permit students to select an option from a broad range of specialty areas. These areas include combustion and environmental engineering, computer-aided design, energy and power, fluid mechanics and thermal sciences, mechanical engineering design, and solid mechanics and materials engineering.

The program outlined below is based on the concept that the mechanical engineer must be prepared to meet the challenge of ever-increasing technical economic and social problems. Graduates of the mechanical engineering curriculum are qualified for professional positions in analysis, research and development, computer-aided design, and manufacturing and for graduate study and research in a wide variety of fields.

Part-Time Study

In response to requests from individuals employed full time in the Washington, D.C., area who wish to obtain a Bachelor of Science degree in Mechanical Engineering in a reasonable period of time, late afternoon and evening classes in the Mechanical Engineering curriculum are scheduled on a regular basis. For example, if a part-time student enrolls for three courses a semester, B.S. degree requirements can be completed in less than 15 semesters.

Junior Year Abroad Program

The School of Engineering and Applied Science and the Institute of Sound and Vibration Research of the University of Southampton, England, have established an exchange program so that graduate students in acoustics at both institutions may transfer academic credits to either University in fulfillment of the requirements for advanced degrees. A special arrangement has now

been made to extend the graduate exchange program to the undergraduate level, enabling some mechanical engineering students to spend the junior year abroad.

The program furthers a student's particular academic interests in mechanical engineering and develops knowledge of world affairs in general and international technical fields in particular.

Applicants must apply for admission to the Junior Year Abroad Program to the department chairman before the end of the fall semester of the sophomore year. Approval must be given by the department chairman and the dean of the School of Engineering and Applied Science.

Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

First Semester

Math 31: Single-Variable Calculus I (3)*
CSci 51: Applications of Computers (3)
Phys 13: General Physics for Engineering and Applied Science (3)
Engl 9 or 10: English Composition: Language as Communication (3)
Elective: Selected from humanities or social sciences (3)

Second Semester

Math 32: Single-Variable Calculus II (3)
EngS 4: Descriptive Geometry and Drafting (3)
Phys 14: Mechanics and Thermal Physics (3)
Chem 13: General Chemistry (4)
Elective: Selected from humanities or social sciences (3)

Third Semester

Math 33: Multivariable Calculus (3)
ApSc 57: Analytical Mechanics I (2)
ApSc 113: Engineering Analysis I (3)
ApSc 115: Engineering Analysis III (3)
Phys 15: Electricity and Magnetism (3)
Elective: Selected from humanities or social sciences (3)

Fourth Semester

ApSc 58: Analytical Mechanics II (3)
ApSc 114: Engineering Analysis II (3)
Phys 16: Modern Physics (3)
CE 140: Materials Science (3)
EE 11: Linear Networks I (3)
Elective: Selected from humanities or social sciences (3)

*Transfer students who have not successfully completed a college-level calculus course with a grade of *C* or better from an accredited institution, or high school students who did not take an advanced placement (AP) calculus course and receive a score of 4 or 5 on the AP test, will be required to take a one-hour locally administered math placement test at registration. This test covers algebra, trigonometry, and graphs. Students who do not place directly into Math 31 as a result of this test may be required to pass Math 3, 6, or 30 as deficiency courses.

Mechanical Engineering Curriculum

Fifth Semester

CE 120: Introduction to the Mechanics of Solids (3)
CE 166: Materials Engineering (2)
CE 167: Mechanics of Materials Laboratory (1)
ME 117: Mechanical Engineering Computations (3)
ME 131: Thermodynamics (3)
ME 134: Introduction to Vibration Analysis (3)

Sixth Semester

EE 20: Introductory Engineering Electronics (3)
ME 120: Methods of Engineering Experimentation (2)
ME 126: Fluid Mechanics I (3)
ME 148: Thermodynamic Systems (3)
ME 191: Mechanical Design (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

ME 187: Heat Transfer (3)
ME 190: Analysis and Synthesis of Mechanisms (3)
ME 193: Engineering Systems Design I (3)
Elective: Technical electives (6)

Eighth Semester

ME 152: Mechanical Engineering Laboratory (2)
ME 182: Electromechanical Control System Design (3)
ME 195: Engineering Systems Design II (2)
ME 196: Design Project (1)
Elective: Selected from humanities or social sciences (3)
Elective: Technical electives (6)

Mechanical Engineering Options

In all option areas a minimum of 12 semester hours of technical electives must be taken from one of the following options. Alternative elective programs or individual course substitutions may be approved upon written request by the student to his or her adviser and the department.

Combustion and Environmental Engineering

ApSc 199: Honors Research Project and Seminar (3)
*ME 155: Fluid Mechanics II (3)
ME 198: Research (3)
ME 221: Intermediate Fluid Mechanics (3)
ME 224: Fundamentals of Combustion Engines (3)
ME 237: Energetics of Fluid Flow I (3)
*ME 261: Air Pollution I (3)
ME 262: Air Pollution II (3)
ME 267: Power Plant Pollution Control (3)
ME 293: Combustion (3)

*Required technical elective for the option indicated.

Computer-Aided Design

ApSc 199: Honors Research Project and Seminar (3)
CSci 150: Introduction to Microcomputers (3)
CSci 153: Design of Switching Systems (3)
CSci 157: Machine and Assembly Language Programming (3)
CSci 158: Algorithmic Methods (3)
EngS 282: Computer-Aided Design (3)
EngS 283: Application of Computer Graphics in Engineering (3)
EngS 284: Numerical Methods in Engineering (3)
EngS 285: Finite Element Methods in Engineering Mechanics (3)
*ME 192: Product Design and Process Engineering (3)
ME 198: Research (3)

Energy and Power

ApSc 199: Honors Research Project and Seminar (3)
EngS 208: Energy Conservation (3)
*ME 155: Fluid Mechanics II (3)
ME 198: Research (3)
ME 257: Energy Technology I (3)
ME 258: Energy Technology II (3)
ME 259: Solar Heating Systems (3)
ME 260: Heating and Air Conditioning of Buildings (3)
ME 291: Power Systems I (3)
ME 292: Power Systems II (3)

Fluid Mechanics and Thermal Sciences

ApSc 199: Honors Research Project and Seminar (3)
EngS 218: Introduction to Continuum Mechanics (3)
*ME 155: Fluid Mechanics II (3)
ME 198: Research (3)
ME 221: Intermediate Fluid Mechanics (3)
ME 231: Hydrodynamics (3)
ME 237: Energetics of Fluid Flow I (3)
ME 280: Intermediate Thermodynamics (3)
ME 288: Convective Heat and Mass Transfer (3)
ME 289: Radiative Heat Transfer (3)

Mechanical Engineering Design

ApSc 199: Honors Research Project and Seminar (3)
EngS 215: Advanced Strength of Materials (3)
EngS 257: Theory of Vibrations (3)
EngS 284: Numerical Methods in Engineering (3)
EngS 285: Finite Element Methods in Engineering Mechanics (3)
*ME 192: Product Design and Process Engineering (3)
ME 198: Research (3)
ME 240: Kinematic Synthesis (3)
ME 241: Engineering Systems Design (3)
ME 242: Advanced Mechanisms (3)
ME 243: Advanced Mechanical Engineering Design (3)

*Required technical elective for the option indicated.

Solid Mechanics and Materials Engineering

ApSc 199: Honors Research Project and Seminar (3)
EngS 215: Advanced Strength of Materials (3)
*EngS 218: Introduction to Continuum Mechanics (3)
EngS 221: Theory of Elasticity I (3)
EngS 231: Structure of Materials (3)
EngS 233: Mechanics of Composite Materials (3)
EngS 234: Composite Materials (3)
EngS 237: Environmental Effects on Materials (3)
EngS 241: Failure of Materials (3)
EngS 285: Finite Element Methods in Engineering Mechanics (3)
ME 198: Research (3)
Phys 170: Elementary Solid State Physics (3)

Mechanical Engineering Undergraduate Courses

117 **Mechanical Engineering Computations** (3)
Application of numerical methods to the solution of mechanical engineering problems. Reduction of physical and engineering systems to computer models. Optimization techniques, physical modeling, numerical methods, and problem solving techniques. Emphasis on use of small-scale computing systems. Prerequisite: CSci 51 and junior status. (Fall)

120 **Methods of Engineering Experimentation** (2)
Acquisition and analysis of experimental data. Laws of modeling and simulation. Report formulation and presentation. Basic principles of measuring instruments and sensors. Fundamentals of digital data acquisition and use of computer-based data systems. Laboratory experiments including the use of strain gages, oscilloscopes, transducers, and computerized data systems. Prerequisite: ME 117. (Spring)

126 **Fluid Mechanics I** (3)
Fluid properties, fluid statics, integral and differential formulations of conservation of mass, momentum, and energy. Bernoulli's equation. Dimensional analysis and similitude. Inviscid flow. Viscous flow. Experimental and computational methods in fluid mechanics. Prerequisite: ApSc 58. (Spring)

131 **Thermodynamics** (3)
Fundamental thermodynamic concepts, Zeroth law of thermodynamics and temperature measurements, work and heat, first law of thermodynamics, properties of pure substances, first-law analysis of some thermodynamic systems, second law of thermodynamics, reversibility, entropy, second-law analysis of thermodynamic systems. Prerequisite: Phys. 14, ApSc 113. (Fall)

134 **Introduction to Vibration Analysis** (3)
Natural frequencies, free vibration, forced vibration. Unbalance, whirling, vibration isolation. Measuring techniques and application of computers in vibration analysis. Multiple degrees of freedom. Dynamic vibration absorbers. Shock and transient vibration. Prerequisite: ApSc 58. (Fall)

148 **Thermodynamic Systems** (3)
Second-law analysis of thermodynamic systems. Mixtures of gases and vapors, properties of air–water vapor mixtures, psychrometry and its appli-

*Required technical elective for the option indicated.

cation in some engineering processes. Power from two-phase systems, Rankine cycle and engine, improving the thermal efficiency of Rankine engines, reheat and regeneration. Gas turbine, Brayton and regenerative cycles. Internal combustion engines, Otto and Diesel cycles. Thermodynamic analysis of reactive systems. Prerequisite: ME 131. (Spring)

152 **Mechanical Engineering Laboratory** (2)
Major project-oriented course—simulates working environment of graduate engineers. Projects are assigned in student's areas of interest; student is expected to design and assemble own experiments. Extensive use of instrumentation and computing facilities. Project proposal, progress reports, final report, and periodic oral presentations required. Prerequisite: ME 120 (Spring)

155 **Fluid Mechanics II** (3)
(Formerly Compressible Fluid Flow)
Potential flow theory: stream and potential functions, La Place's equation, superposition of elementary flows. D'Alembert's paradox. Boundry layer theory: Von Karman momentum integral method. Drag on immersed bodies: form drag and skin friction for streamlined and bluff bodies in laminar and turbulent flow. Turbulence: Prandtl mixing length, Eddy viscosity, and transport phenomena. Compressible flow: acoustic speed, Mach number, isentropic flow, nozzle flow and flow around airfoils and turbine blades, normal and oblique shock phenomena, Raleigh and Fanno flows. Experimental and computational methods in fluid mechanics. Prerequisite: ME 126 and ME 131. (Fall)

182 **Electromechanical Control System Design** (3)
Application of control theory to the design of electromechanical systems. Characteristics of transducers, valves, and other control components. Mathematical models of open- and closed-loop electromechanical systems. Root locus and frequency response methods; application to the synthesis of feedback systems by both manual and computer-aided techniques. Prerequisite: ApSc 114; ME 117, 134. (Spring)

187 **Heat Transfer** (3)
Heat transfer processes. General heat conduction equations; steady- and unsteady-state heat conduction problems. Methods of analysis; analytical, analog, and numerical solution methods. Fundamentals of convective heat transfer. Evaluation of convective heat transfer coefficients; dimensional analysis, boundary-layer approach, analogy between heat and momentum transfer. Energy exchange by thermal radiation; fundamental concepts and laws, radiation properties, radiative heat transfer between surfaces. Design considerations: heat-exchanger design and selection. Prerequisite: senior status. (Fall)

190 **Analysis and Synthesis of Mechanisms** (3)
Kinematics and dynamics of mechanisms. Displacements, velocities, and accelerations in linkage, cam, and gear systems by analytical, graphical, and computer methods. Synthesis of linkages to meet prescribed performance requirements. Prerequisite: ApSc 58. (Fall)

191 **Mechanical Design** (3)
Integration of knowledge of strength of materials in a design context. Stresses and deflections in engineering structures. Theories of failure. Introduction to the design of mechanical components, such as fasteners, shafts, springs. Introduction to the use of computers in mechanical engineering design. Prerequisite: CE 120, ME 117. (Spring)

192 **Product Design and Process Engineering** (3)
Introduction to product design and modern manufacturing techniques. Functional, technological, and economic considerations, such as production volume, energy and materials consumption, and labor. Criteria for product acceptance, cost, and other factors. Properties and behavior of metals and

polymers. Capabilities and limitations of various basic and secondary processes; influence on product design. Computer-aided manufacturing and flexible manufacturing systems. Prerequisite: junior status. (Spring)

193 **Engineering Systems Design I** (3)
Creative engineering design, problem definition, and concept generation. Design of and familiarization with bearings, clutches, brakes, and couplings. Optimization of system design using computers and design projects. Graphical communication, project presentation, and use of existing design resources. Prerequisite: ME 191. (Fall)

194 **Energy Conversion** (3)
Energy sources and utilization, principal fuels for energy conversion. Production of thermal energy, conversion of chemical energy, fossil fuel systems. Energy conservation and environmental considerations in energy conversion and use. Production of electrical energy, fundamental principles, technological options, longer range possibilities. Energy management and economical considerations. Prerequisite: EE 20, ME 148. (Spring)

195 **Engineering Systems Design II** (2)
Design of systems involving a large variety of constraints and requiring ingenuity and application of principles from thermal systems, heat transfer, fluid mechanics, and mechanical components. Consideration of economic, safety, and reliability factors in the final design. Prerequisite: ME 193; concurrent registration: ME 196. (Spring)

196 **Design Project** (1)
Identification and preparation of a design project, including problem formulation, feasibility studies and preliminary design, prototype development and testing, and design optimization. Concurrent registration: ME 195. (Spring)

198 **Research** (1 to 3)
Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and Spring)

Engineering Science Undergraduate Course

4 **Descriptive Geometry and Drafting** (3)
Introductory descriptive geometry. Use of equipment. Points, lines, curves, planes, and surfaces; principal, auxiliary, and orthographic views; isometric views, intersection of surfaces. Technical sketching, dimensions and precision, machine elements. Detail and assembly drawings. Introduction to computer-aided drafting. (Fall and Spring)

Graduate Study

Developments in science and technology in the decades to come will require the engineer to be thoroughly grounded in fundamentals as well as in the newly emerging technological and scientific disciplines. The modern engineer must also master techniques in analysis, computation, design, and synthesis. Amid the proliferation of knowledge and technological specialty, the department adheres to the principle that versatility and depth in scientific fundamentals should be the characteristic features of any graduate program that attempts to prepare the student to cope with engineering developments.

The Department of Civil, Mechanical, and Environmental Engineering offers graduate programs in various areas of concentration, leading to the Master of Science, the professional, and the Doctor of Science degrees.

The Doctor of Science degree is offered in the following areas: acoustics; aeronautics; energy; environmental engineering; fluid mechanics and thermal

sciences; ocean, coastal, and marine engineering; solid mechanics and materials engineering; structural engineering; structures and dynamics; and water resources (except Option 2, water resources planning, which is for the M.S. degree only).

The Master of Science and the professional degrees are offered in all of the aforementioned areas and in the following areas: civil engineering (M.S. degree only), computer-aided design, environmental modeling (M.S. degree only), geotechnical engineering, mechanical engineering design, and public works engineering.

Courses for these specializations are listed on the following pages. As part of the interdisciplinary program, students elect approved courses from other departments of the School of Engineering and Applied Science and from other schools and divisions of the University. Depending on the interest of the student, some of the programs leading to the Master of Science and, by special permission of the appropriate department chairman, Doctor of Science degrees are given at the NASA–Langley Research Center, Hampton, Virginia. NASA–Langley's extensive scientific and engineering facilities and equipment are used whenever feasible.

Each program is arranged to fit the student's individual needs and interests and to use previous experience and background. This background should normally include an undergraduate degree in engineering, the physical sciences, or applied mathematics. Each student is assigned a faculty adviser on the basis of study interests, enabling a close student–faculty relationship to develop during the course of the program.

Computer Requirements

Because the use of computers has become an integral part of both education and research, each student entering graduate study in the Department of Civil, Mechanical, and Environmental Engineering should be familiar with the use of computers. The ability to use computers will be assumed in graduate courses.

Language Requirement for Doctoral Program

No foreign language is required for the Doctor of Science degree program. A proficiency in one computer programming language, however, must be demonstrated to the doctoral adviser.

Fields and Areas of Concentration

Programs of study in any field of concentration will generally include courses from appropriate allied areas. In this section, an asterisk indicates that a course or program is offered at NASA–Langley Research Center but may be offered on campus when arranged.

*Acoustics**

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III

*Offered at NASA–Langley Research Center but may be offered on campus when arranged.

ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
*EngS 203–4: Probability and Statistics of Metrology
EngS 217: Analytical Mechanics
EngS 257: Theory of Vibrations
EngS 270: Theoretical Acoustics I
*EngS 271: Random Process Theory I
*EngS 272: Random Process Theory II
*EngS 273: Time Series Analysis
EngS 274: Environmental Noise Control
*EngS 275: Theoretical Acoustics II
*EngS 276: Acoustical and Mechanical Measurements
*EngS 277: Physical Acoustics
*EngS 278: Psychological and Physiological Acoustics
*EngS 279: Human Factors in Engineering
*EngS 280: Special Topics in Acoustics
EngS 298: Research
EngS 299–300: Thesis Research
*EngS 310: Aeroacoustics
*EngS 311: Nonlinear Acoustics
*EngS 312: Theory of Random Vibration
*EngS 313: Structural Acoustics Interaction
EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research
ME 216: Structural Dynamics
ME 221: Intermediate Fluid Mechanics
ME 312: Theory of Turbulence

Required courses for MS degree: ApSc 211, 213; EngS 257, 270, 274 or 276; ME 221. Required courses for the professional and doctoral degrees are established by the advisory committee in consultation with the student.

*Aeronautics**

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
EE 202: Linear System Theory I
EngS 217: Analytical Mechanics
EngS 257: Theory of Vibrations
EngS 284: Numerical Methods in Engineering
ME 221: Intermediate Fluid Mechanics
ME 222: Applied Fluid Dynamics
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 233: Aeroelasticity I
ME 234: Aeroelasticity II
ME 235: Compressible Flow
ME 237: Energetics of Fluid Flow I
*ME 248: Seminar: Aircraft Design I
*ME 249: Seminar: Aircraft Design II

*Offered at NASA–Langley Research Center but may be offered on campus when arranged.

*ME 270: Aerodynamics of Flight Vehicles
*ME 271: VTOL Aircraft Technology
*ME 272: Powered-Lift Technology
*ME 273: Principles of Automatic Flight Control
*ME 274: Principles of Flight Guidance
ME 275: Stability and Control of Vehicles
ME 276: Mechanics of Space Flight
ME 277: Numerical Methods in Fluid Mechanics
*ME 279: Special Topics in Flight Sciences
ME 281: Nonequilibrium Thermodynamics
*ME 290: Kinetic Theory of Gases
ME 295: Statistical Thermodynamics
ME 298: Research
ME 299–300: Thesis Research
ME 312: Theory of Turbulence
ME 315: Hypersonic Flow
ME 398: Advanced Reading and Research
ME 399: Dissertation Research

Required courses for MS degree: ApSc 211, 213; ME 221, 275.
Required courses for the professional and doctoral degrees are established by the advisory committee in consultation with the student.

Civil Engineering

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 204: Applied Soil Mechanics I
CE 205: Applied Soil Mechanics II
CE 206: Geotechnical Engineering
CE 208: Rock Engineering
CE 210: Methods of Structural Analysis
CE 211: Environmental Chemistry
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 215: Urban Construction Technology
CE 216: Advanced Hydrology
CE 220: Urban Transportation Engineering
CE 221: Pavement and Runway Design
CE 223: Traffic Engineering
CE 240: Principles of Environmental Engineering I
CE 241: Principles of Environmental Engineering II
CE 242: Solid Waste Disposal
CE 243: Environmental Impact Assessment
CE 250: Advanced Metal Structures
CE 251: Advanced Reinforced Concrete Structures
CE 255: Introduction to Ocean and Coastal Engineering
CE 256: Coastal Processes
CE 257: Harbor and Coastal Engineering
CE 276: Water Resources Planning and Control
CE 298: Research
CE 299–300: Thesis Research
EAd 204: Administration of Engineering Contracts

*Offered at NASA–Langley Research Center but may be offered on campus when arranged.

EAd 210: Engineering Law
EAd 241: Construction Management I
EAd 242: Construction Management II
EAd 261: Economic Analysis in Engineering Planning
EAd 265: Transportation Management I
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 398: Advanced Reading and Research
ME 255–56: Urban Transportation Technology
OR 201: Survey of Operations Research Methods
OR 231: Theory of Traffic Flow

Public Works Option
Required courses for MS degree: CE 202, 206, 213, 240; EngS 285. For professional degree: CE 211 or 217 or 223; EngS 284 or OR 201; one additional course from the sequence EAd 241, 242, 243.

Transportation Option
Required courses for MS degree: CE 202, 206, 213, 240; EngS 285. For professional degree: ApSc 212, 213 or 214; EngS 221 or 315, 285, 288.

Computer-Aided Design

ApSc 213: Analytical Methods in Engineering III
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 210: Methods of Structural Analysis
CE 250: Advanced Metal Structures
CE 251: Advanced Reinforced Concrete Structures
CE 254: Special Topics in Structural Engineering
CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
CSci 147: Assembly Language Programming of Microcomputers
CSci 157: Assembly Language Programming of Large System Computers
CSci 158: Algorithmic Methods
CSci 159: Programming and Data Structures
CSci 161: Discrete Structures for Computing
CSci 201: Introduction to Computer Systems
CSci 208: Computer Programming
CSci 212: Discrete Analysis in Computer Science
CSci 214: Data Structures
CSci 219: Interactive Computer Graphics
CSci 227: Management Information Systems and Database Management
EngS 257: Theory of Vibrations
EngS 282: Computer-Aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
ME 216: Structural Dynamics
ME 218: Design of Floating and Submerged Marine Vehicles
ME 237: Energetics of Fluid Flow I
ME 238: Energetics of Fluid Flow II
ME 240: Kinematic Synthesis

ME 241: Engineering Systems Design
ME 242: Advanced Mechanisms
ME 243: Advanced Mechanical Engineering Design
ME 246: Electromechanical Control Systems

Required courses for MS degree: ApSc 213; CSci 159, 201; EngS 282, 284; CSci 219 or EngS 283. In place of CSci 201, CSci 157 or 147 and 158 may be taken. For professional degree: CE 203, 250 or 251, 254 or EngS 257, CSci 208, 227.

Energy

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 215: Analytical Methods in Engineering V
CE 243: Environmental Impact Assessment
EAd 221–22: Environmental Management
EAd 283: Systems Engineering I
EngS 206: Technology and Human Needs
EngS 207: Engineering Climatology
EngS 208: Energy Conservation
EngS 210: Quantitative Aspects of Social Phenomena
EngS 212: Nonrenewable Resources
EngS 213: Renewable Resources
EngS 242: Materials Recycling and Recovery
EngS 270: Theoretical Acoustics I
EngS 274: Environmental Noise Control
EngS 284: Numerical Methods in Engineering
ME 204: Advanced Instrumentation Techniques
ME 221: Intermediate Fluid Mechanics
ME 224: Fundamentals of Combustion Engines
ME 225: Turbomachinery I
ME 226: Turbomachinery II
ME 227: Viscous Flow
ME 235: Compressible Flow
ME 237: Energetics of Fluid Flow I
ME 257: Energy Technology I
ME 258: Energy Technology II
ME 259: Solar Heating Systems
ME 260: Heating and Air Conditioning of Buildings
ME 261: Air Pollution I
ME 262: Air Pollution II
ME 264: Air Pollution Seminar
ME 267: Power Plant Pollution Control
ME 280: Intermediate Thermodynamics
ME 281: Nonequilibrium Thermodynamics
ME 283: Nuclear Reactor Engineering I
ME 284: Nuclear Reactor Engineering II
ME 287: Heat Conduction
ME 290: Kinetic Theory of Gases
ME 291–92: Power Systems
ME 293: Combustion
ME 298: Research
ME 299–300: Thesis Research
ME 312: Theory of Turbulence
ME 313: Magnetofluidmechanics
ME 398: Advanced Reading and Research
ME 399: Dissertation Research
OR 201: Survey of Operations Research: Deterministic Models

Required courses for degree programs† in energy technology (Option 1); MS‡§—ApSc 211, 213; ME 221, 257, 258, 280, 288. Professional degree—competency in above and ES 284; ME 291, 292, 298 (6). DSc§—competency in above and ApSc 212, 215.

Required courses for degree programs† in energy systems (Option 2): MS‡—EngS 284; ME 257, 258, 261; OR 201. Applied Scientist—competency in above and ME 298 (6). DSc—competency in above and requirements to be made by doctoral advisory committee to benefit the student's intellectual/professional aspirations.

Environmental Engineering

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
CE 211: Environmental Chemistry
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 216: Advanced Hydrology
CE 219: Groundwater and Seepage
CE 237: Advanced Sanitary Engineering Design
CE 240: Principles of Environmental Engineering I
CE 241: Principles of Environmental Engineering II
CE 242: Solid Waste Disposal
CE 243: Environmental Impact Assessment
CE 255: Introduction to Ocean and Coastal Engineering
CE 272: Biological Wastewater Treatment
CE 273: Water Supply Engineering
CE 276: Water Resources Planning and Control
CE 277: Industrial Waste Treatment
CE 278: Pollutant Transport
CE 280: Water Resources Systems
CE 283: Special Topics in Environmental Engineering
CE 298: Research
CE 299–300: Thesis Research
EngS 242: Materials Recycling and Recovery
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods
ME 261: Air Pollution I
ME 262: Air Pollution II
ME 267: Power Plant Pollution Control

Required courses for MS degree: CE 212, 213, 240, 255; ApSc 211 or 213 or EngS 284. For DSc degree: ApSc 213; CE 237, 241, 272.

*Environmental Modeling**

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
*EngS 263: Atmospheric Physics for Engineers I
*EngS 264: Atmospheric Physics for Engineers II

*Offered at NASA–Langley Research Center but may be offered on campus when arranged.
†All students are expected to have competency in the use of computers.
‡Students without research experience are encouraged to pursue the thesis option.
§Students presenting themselves for comprehensive and/or qualifying examinations are encouraged to be appreciative of the contents of EngS 218 and ME 237.

EngS 284: Numerical Methods in Engineering
EngS 298: Research
EngS 299–300: Thesis Research
EngS 314: Advanced Numerical Methods in Engineering
ME 221: Intermediate Fluid Mechanics
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 257: Energy Technology I
ME 285: Reaction Kinetics
ME 288: Convective Heat and Mass Transfer
ME 289: Radiative Heat Transfer
ME 296: Special Topics in Heat and Mass Transfer
ME 312: Theory of Turbulence

Required courses for MS degree: ApSc 211, 213; EngS 263, 264.

Fluid Mechanics and Thermal Sciences

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 274: Mechanics of Water Waves
EE 133: Electromagnetic Waves and Microwave System Design
EE 236: Plasma Dynamics
EngS 218: Introduction to Continuum Mechanics
EngS 284: Numerical Methods in Engineering
EngS 289: Special Topics in Theoretical and Applied Mechanics
EngS 315: Introduction to Nonlinear Mechanics of Continua
ME 218: Design of Floating and Submerged Marine Vehicles
ME 221: Intermediate Fluid Mechanics
ME 222: Applied Fluid Dynamics
ME 225: Turbomachinery I
ME 226: Turbomachinery II
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 233: Aeroelasticity I
ME 235: Compressible Flow
ME 237: Energetics of Fluid Flow I
ME 238: Energetics of Fluid Flow II
ME 261: Air Pollution I
ME 277: Numerical Methods in Fluid Mechanics
ME 280: Intermediate Thermodynamics
ME 281: Nonequilibrium Thermodynamics
ME 287: Heat Conduction
ME 288: Convective Heat and Mass Transfer
ME 289: Radiative Heat Transfer
ME 293: Combustion
ME 295: Statistical Thermodynamics
ME 297: Special Topics in Fluid Mechanics
ME 298: Research
ME 299–300: Thesis Research
ME 310: Mechanics of Non-Newtonian Fluids
ME 311: Nonsteady Flow
ME 312: Theory of Turbulence
ME 313: Magnetofluidmechanics
ME 315: Hypersonic Flow

ME 317: Physical Gas Dynamics
ME 398: Advanced Reading and Research
ME 399: Dissertation Research

Required courses for MS degree: ApSc 211, 213; ME 221, 280, 288 (also ME 227 for nonthesis students). For professional and DSc degrees: Fluid Mechanics—ApSc 212 or 214 or 216, 215; ME 231, 311, 312; Thermal Sciences—ApSc 212 or 214 or 216, 215; ME 235, 287, 289.

Geotechnical Engineering

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 204: Applied Soil Mechanics I
CE 205: Applied Soil Mechanics II
CE 206: Geotechnical Engineering
CE 207: Soil Dynamics
CE 208: Rock Engineering
CE 209: Probabilistic Methods in Geotechnical Engineering
CE 210: Methods of Structural Analysis
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 219: Groundwater and Seepage
CE 221: Pavement and Runway Design
CE 240: Principles of Environmental Engineering I
CE 255: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering
CE 265: Special Topics in Geotechnical Engineering
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
EngS 221: Theory of Elasticity I
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
†Geol 128: Geomorphology
†Geol 189: Geophysics for Geologists
†Geol 224: Advanced Structural Geology

Required courses for MS degree: CE 202, 206, 213, 240; EngS 285.
For professional degree: CE 207, 208, 209, 219; EngS 221.

Mechanical Engineering Design

ApSc 213: Analytical Methods in Engineering III
CE 253: Failure and Reliability Analysis of Engineering Structures
EngS 215: Advanced Strength of Materials
EngS 257: Theory of Vibrations
EngS 259: Random Vibrations of Structures
EngS 282: Computer-Aided Design

†For course descriptions, see the *Undergraduate and Graduate Programs Bulletin*.

EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
ME 218: Design of Floating and Submerged Marine Vehicles
ME 221: Intermediate Fluid Mechanics
ME 225: Turbomachinery I
ME 226: Turbomachinery II
ME 240: Kinematic Synthesis
ME 241: Engineering Systems Design
ME 242: Advanced Mechanisms
ME 243: Advanced Mechanical Engineering Design
ME 246: Electromechanical Control Systems
ME 298: Research
ME 299–300: Thesis Research

Required courses for MS degree: ApSc 213 or EngS 284; ME 241, 243, 246.

Ocean, Coastal, and Marine Engineering

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 203: Prestressed Concrete Structures
CE 206: Geotechnical Engineering
CE 208: Rock Engineering
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 216: Advanced Hydrology
CE 219: Groundwater and Seepage
CE 240: Principles of Environmental Engineering I
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 255: Introduction to Ocean and Coastal Engineering
CE 256: Coastal Processes
CE 257: Harbor and Coastal Engineering
CE 265: Special Topics in Geotechnical Engineering
CE 274: Mechanics of Water Waves
CE 275: Special Topics in Ocean Engineering
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
CE 312: Advanced Hydraulics
CE 398: Advanced Reading and Research
CE 399: Dissertation Research
EngS 228: Physical Oceanography
EngS 257: Theory of Vibrations
EngS 260: Random Process Theory in Engineering
EngS 273: Time Series Analysis
EngS 284: Numerical Methods in Engineering
†Geol 181: General Oceanography
ME 218: Design of Floating and Submerged Marine Vehicles
ME 221: Intermediate Fluid Mechanics

†For course description, see the *Undergraduate and Graduate Programs Bulletin.*

ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 277: Numerical Methods in Fluid Mechanics
ME 297: Special Topics in Fluid Mechanics
ME 312: Theory of Turbulence

Required courses for degree programs in hydromechanics: MS—ApSc 211 or 213 or EngS 284; CE 212, 213, 240, 256. DSc—ApSc 212, 214, 215; CE 274; ME 227, 231, 312.

Required courses for degree programs in ocean, coastal, and marine engineering: MS—ApSc 211 or 213 or EngS 284; CE 212, 213, 240, 256. DSc—ApSc 212, 215; CE 256, 274; ME 231; EngS 257 or 273.

Solid Mechanics and Materials Engineering

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 207: Soil Dynamics
CE 209: Probabilistic Methods in Geotechnical Engineering
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
EngS 215: Advanced Strength of Materials
EngS 217: Analytical Mechanics
EngS 218: Introduction to Continuum Mechanics
EngS 221: Theory of Elasticity I
EngS 222: Theory of Elasticity II
EngS 229: Transformations in Materials
EngS 230: Deformation of Materials
EngS 231: Structure of Materials
EngS 233: Mechanics of Composite Materials
EngS 234: Composite Materials
EngS 236: Experimental Techniques in Materials Science
EngS 237: Environmental Effects on Materials
EngS 240: Fracture Mechanics
EngS 241: Failure of Materials
EngS 249: Special Topics in Materials Science
EngS 256: Introduction to the Theories of Inelastic Media
EngS 257: Theory of Vibrations
EngS 259: Random Vibration of Structures
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
EngS 289: Special Topics in Theoretical and Applied Mechanics
EngS 298: Research
EngS 299–300: Thesis Research
EngS 315: Introduction to Nonlinear Mechanics of Continua
EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research
ME 216: Structural Dynamics
ME 221: Intermediate Fluid Mechanics

ME 280: Intermediate Thermodynamics
ME 281: Nonequilibrium Thermodynamics
ME 295: Statistical Thermodynamics
ME 310: Mechanics of Non-Newtonian Fluids
†BiSc 272: Electron Microscopy
†Chem 207: Chemical Bonding
†Chem 211–12: Physical Chemistry
†Chem 213: Chemical Thermodynamics
†Chem 216: Statistical Mechanics
†Geol 113: Crystallography
†Phys 167: Principles of Quantum Physics
†Phys 168: Applied Quantum Physics
†Phys 170: Elementary Solid State Physics
†Phys 211: Advanced Mechanics
†Phys 221–22: Quantum Mechanics
†Phys 224: Statistical Mechanics
†Phys 243: Solid State Physics: Structure and Binding
†Phys 244: Solid State Physics: Electronic Processes in Metals

Required courses for degree programs in solid mechanics: MS—ApSc 211, 213; EngS 218, 231; ME 280. Professional degree—EngS 222, 240, 241, 256, 285. DSc—ApSc 212, 215; EngS 222, 230, 256, 315.

Required courses for degree programs in materials engineering: MS—ApSc 211, 213; EngS 218, 231; ME 280. Professional degree—EngS 234, 237, 240, 241. DSc—ApSc 212; EngS 229, 230; ME 295.

Structural Engineering

ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 204: Applied Soil Mechanics I
CE 205: Applied Soil Mechanics II
CE 206: Geotechnical Engineering
CE 207: Soil Dynamics
CE 210: Methods of Structural Analysis
CE 215: Urban Construction Technology
CE 250: Advanced Metal Structures
CE 251: Advanced Reinforced Concrete Structures
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 256: Coastal Processes
CE 257: Harbor and Coastal Engineering
CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
CE 266: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I
CE 267: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards II
CE 298: Research

†For course description, see the *Undergraduate and Graduate Programs Bulletin*.

CE 299–300: Thesis Research
CE 398: Advanced Reading and Research
CE 399: Dissertation Research
EngS 215: Advanced Strength of Materials
EngS 221: Theory of Elasticity I
EngS 233: Mechanics of Composite Materials
EngS 234: Composite Materials
EngS 240: Fracture Mechanics
EngS 241: Failure of Materials
EngS 256: Introduction to the Theories of Inelastic Media
EngS 257: Theory of Vibrations
EngS 259: Random Vibration of Structures
EngS 282: Computer-Aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics

Required courses for degree programs: MS—CE 201 or 202, 206, 210; EngS 215, 285. Professional—CE 250 or 251, EngS 257 or CE 253, 266 or 267; EngS 282 or 288. DSc—ApSc 212, 213 or 214; EngS 257; CE 254 or EngS 259; EngS 221, 288.

Structures and Dynamics

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
†CE 207: Soil Dynamics
†CE 210: Method of Structural Analysis
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
†CE 266: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazard I
†CE 267: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazard II
EE 157: Machine and Assembly Language Programming
†EngS 215: Advanced Strength of Materials
†EngS 217: Analytical Mechanics
†EngS 218: Introduction to Continuum Mechanics
EngS 221: Theory of Elasticity I
EngS 222: Theory of Elasticity II
†EngS 233: Mechanics of Composite Materials
EngS 234: Composite Materials
†EngS 240: Fracture Mechanics
†EngS 256: Introduction to the Theories of Inelastic Media
EngS 257: Theory of Vibrations
EngS 259: Random Vibration of Structures
‡EngS 281: Advanced Programming Techniques for Engineering Mechanics Problems

†Course offered on campus only.
‡Course offered at NASA–Langley Research Center only

EngS 282: Computer-Aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
†EngS 286: Analysis and Design of Thin-Walled Structures
†EngS 287: Automated Design of Complex Structures
EngS 288: Advanced Finite Element Methods in Structural Mechanics
EngS 289: Special Topics in Theoretical and Applied Mechanics
EngS 299–300: Thesis Research
EngS 314: Advanced Numerical Methods in Engineering
‡EngS 315: Introduction to Nonlinear Mechanics of Continua
EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research
ME 216: Structural Dynamics
†ME 223: Aeroelasticity
†ME 248: Seminar: Aircraft Design I
OR 251: Linear Programming
OR 252: Nonlinear Programming

Required courses for degree programs **on campus:** MS—ApSc 213; CE 253, 261, 263; EngS 215, 257. DSc—ApSc 212, 214 or 215; ME 216; EngS 221, 259.

Required courses for degree program at NASA–Langley Research Center: MS—ApSc 213; CE 261 or 263; EngS 221 or 234, 284, 285, 286 or 287. DSc—ApSc 214; EngS 281, 288; ME 223.

Water Resources Engineering

Option 1: Water Resources Engineering

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
CE 208: Rock Engineering
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 216: Advanced Hydrology
CE 219: Groundwater and Seepage
CE 240: Principles of Environmental Engineering I
CE 243: Environmental Impact Assessment
CE 255: Introduction to Ocean and Coastal Engineering
CE 256: Coastal Processes
CE 273: Water Supply Engineering
CE 274: Mechanics of Water Waves
CE 276: Water Resources Planning and Control
CE 278: Pollution Transport System
CE 281: Special Topics in Water Resources
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
CE 312: Advanced Hydraulics
CE 398: Advanced Reading and Research

†Course offered at NASA–Langley Research Center only.
‡Course offered on campus only.

CE 399: Dissertation Research
EngS 260: Random Process Theory in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
ME 221: Intermediate Fluid Mechanics
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 277: Numerical Methods in Fluid Mechanics
ME 312: Theory of Turbulence
OR 251: Linear Programming
OR 252: Nonlinear Programming
OR 273: Digital Systems Simulation

Required courses for degree programs: MS (thesis option)—ApSc 211 or EngS 284; CE 212, 213, 282. MS (nonthesis option)—ApSc 211 or 213 or EngS 284; CE 212, 213, 240, 255. Professional and DSc—ApSc 211, 213; CE 282, 312; ME 221.

Option 2: Water Resources Planning

ApSc 213: Analytical Methods in Engineering III
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 216: Advanced Hydrology
CE 240: Principles of Environmental Engineering I
CE 242: Solid Waste Disposal
CE 243: Environmental Impact Assessment
CE 256: Coastal Processes
CE 273: Water Supply Engineering
CE 276: Water Resources Planning and Control
CE 278: Pollution Transport System
CE 280: Water Resources Systems
CE 281: Special Topics in Water Resources
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
EAd 211–12: Engineering Administration
EAd 269: Elements of Decision Making and Problem Solving
EAd 283: Systems Engineering I
EAd 284: Systems Engineering II
EngS 206: Technology and Human Needs
EngS 213: Renewable Resources
EngS 260: Random Process Theory in Engineering
EngS 284: Numerical Methods in Engineering
ME 221: Intermediate Fluid Mechanics
OR 251: Linear Programming
OR 252: Nonlinear Programming
OR 253: Integer, Network, and Dynamic Programming
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 377: Advanced Stochastic Models in Operations Research
†Econ 217–18: Survey of Economics

†For course descriptions, see the *Undergraduate and Graduate Programs Bulletin*.

†Econ 235: Energy Resources and Policy
†Econ 237: Seminar: Economics of the Environment and Natural Resources
†Geog 222: Seminar: Resources and the Environment
†Geog 223: Seminar: The Population–Food Balance
†PSc 206: Science, Technology, and Public Affairs

Required courses for degree programs: MS (thesis option)—ApSc 211 or 213 or EngS 284; CE 212, 213, 276. MS (nonthesis option)—ApSc 211 or 213 or EngS 284; CE 212, 213, 240, 255, 276, 280.

Civil Engineering Graduate Courses

Courses designated as "As arranged" are not offered on a regular basis.

201 Design of Metal Structures (3)
Structural behavior of metal structures, conception and design of advanced structural components and systems, hysteretic behavior, plastic design principles, box-type girders, cable systems, composite girders, and special topics. Prerequisite: CE 191 or equivalent. (Spring)

202 Design of Reinforced Concrete Structures (3)
Structural behavior of reinforced concrete structures, conception and design of structural components, prestressed concrete, slabs, ultimate strength and deformation, box-type girders, hysteretic behavior, safety considerations, and special topics. Prerequisite: CE 192 or equivalent. (Fall)

203 Prestressed Concrete Structures (3)
Structural behavior and failure modes of prestressed concrete structures; design in prestressed concrete, including long-span structures, bridges, and precast systems. Prerequisite: CE 192 or equivalent. (Spring)

204 Applied Soil Mechanics I (3)
Theories of soil strength; bearing capacity of shallow foundations and their design; deep foundations, including pile types and design criteria; theories of lateral earth pressure with applications; stability analyses of slopes. Selected experiments in the soil mechanics laboratory. Prerequisite: approval of Department. (Spring, even years)

205 Applied Soil Mechanics II (3)
Nature of soil, including geological and pedological aspects; flow of water in soil; seepage involving foundations, dams, and wells; stress distribution in earth masses; one- and three-dimensional theories of consolidation; analysis of settlement. Selected experiments in the soil mechanics laboratory. Prerequisite: approval of Department. (Fall, even years)

206 Geotechnical Engineering (3)
Principles of soil mechanics and structural mechanics applied to the analysis and design of spread footings and mat foundations, pile foundations, retaining structures, including sheeting and bracing systems, and waterfront structures. Problems associated with subsurface exploration, dewatering excavations, and underpinning. Prerequisite: approval of Department. (Spring)

207 Soil Dynamics (3)
Stress–strain behavior of soil under transient and repeated loads, effects of earthquakes upon foundations and earth dams, design of machinery foundations. Prerequisite: CE 204. (Fall, odd years)

208 Rock Engineering (3)
Classification and properties of rock; nature of rock masses and rock discontinuities; field exploration; methods of excavation; design and applications to foundation slopes, tunnels, and chambers in rock. Prerequisite: approval of Department. (Spring, odd years)

†For course description, see the *Undergraduate and Graduate Programs Bulletin*.

209 **Probabilistic Methods in Geotechnical Engineering** (3)
Review of probability concepts; probabilistic theory for particulate media; variability of soil properties; applications of reliability analysis to geotechnical problems such as shallow foundations and soil slopes; decision analysis in geotechnical engineering. (Fall, even years)

210 **Methods of Structural Analysis** (3)
Modern methods of analysis of statically indeterminate structures, matrix analysis based on flexibility, stiffness, energy and variational methods, substructuring techniques; consideration of plastic collapse of structures; introduction to the finite element method. Prerequisite: graduate status. (Fall)

211 **Environmental Chemistry** (3)
(Formerly Physical and Chemical Wastewater Treatment)
Principles and laboratory operations in environmental chemistry, with primary emphasis on chemistry applicable to water supply, wastewater treatment, and hazardous waste management. Emphasis on advanced analytical techniques, including HPLC, GC, and AA. Prerequisite or concurrent registration: CE 240. (Fall, odd years)

212 **Open Channel Flow** (3)
Types and regimes of flow; energy and momentum principles, uniform flow, gradually varied flow, spatially and rapidly varied flow. Flow in nonprismatic channels. Unsteady flow; dam break problem, flood routing. Prerequisite: CE 193 or ME 221. (Fall)

213 **Hydraulic Engineering** (3)
Principles and practice of hydraulic design of conveyance, regulating and measurement structure. Design considerations for spillways, energy dissipator, inlet and outlet works related to dams. Forces acting on hydraulic structure and stability analysis. Selection and operation of hydraulic turbines and pumps. Design considerations for flow through pipes. Flow transients and cavitation. Prerequisite: CE 193 or approval of Department. (Spring)

214 **Design of Dams** (3)
Project planning and investigations. Types of dams; design of earth–rock fill dams and concrete gravity dams. Design of outlets, spillways, and appurtenances. Construction methods for dams. Reservoir sedimentation. Safety inspection of dams. Prerequisite: CE 193 or graduate status. (Spring, even years)

215 **Urban Construction Technology** (3)
Precedents and contemporary trends in urban housing, building, and planning technology. Prerequisite: approval of Department. (As arranged)

216 **Advanced Hydrology** (3)
Precipitation, evaporation, and transpiration. Soil physics; stream flow, drainage basins, hydrograph analysis, and stream-flow routing. Design criteria, flood frequency statistics and analysis, flood forecasting and control, water supply forecasting. Prerequisite: CE 195 or equivalent. (Spring, even years)

219 **Groundwater and Seepage** (3)
Permeability theory of groundwater flow, flownets, analogs, computer solutions; applications to engineering problems such as excavation dewatering, flow through dams, stabilization of earth slopes. Prerequisite: ApSc 211. (Spring, odd years)

220 **Urban Transportation Engineering** (3)
Introduction to urban transportation planning. Analysis of urban transportation requirements. Evaluation procedure for the selection between alternative solutions. Prerequisite: approval of Department. (Fall, odd years)

221 Pavement and Runway Design (3)
Pavement types, wheel-load characteristics; stresses in pavements and subgrades; empirical methods of design of flexible and rigid highway and airfield pavements; general principles of runway design. Prerequisite: CE 202; 204 or 205. (Spring, odd years)

222 Stations and Terminals (3)
Unified treatment of the functions and operations of stations and terminals of transportation systems; emphasis on specifications and planning criteria. Problems of locating the facility, passenger and freight handling, intramodal and intermodal interfacing, communication and control. Illustrations include railroad and subway stations, bus terminals, airports, and harbors. Prerequisite: approval of Department. (Spring, even years)

223 Traffic Engineering (3)
Roadway traffic capacity and other road network performance measures; methods of characterizing steady and unsteady traffic flow phenomena, traffic behavior monitoring techniques, instruments, and data processing; impact of vehicle and operator dynamics on traffic flow behavior; road bottleneck flow dynamics; traffic control signalization theory and practical implementation; traffic signal control systems for conventional street networks and limited-access expressways; examples of traffic control system implementations. Prerequisite: approval of Department. (Fall, even years)

237 Advanced Sanitary Engineering Design (3)
Basic principles and practical considerations; hydraulic and structural requirements; basic parameters and elements of design; layout and design of water supply and sewage systems, pumping stations, and wastewater treatment plants; development of design parameters; cost and financing; existing plant expansions. Prerequisite or concurrent registration: CE 240, 241. (Fall, even years)

240 Principles of Environmental Engineering I (3)
(Formerly Environmental Microbiology)
Basic concepts in environmental engineering, including chemistry, microbiology, reactor characteristics, sedimentation, filtration, bacterial kinetics, and mass transfer operations. (Fall)

241 Principles of Environmental Engineering II (3)
(Formerly Environmental Chemistry)
Application of the principles presented in CE 240 to design of facilities for water treatment, wastewater treatment, and hazardous waste management. Prerequisite: CE 240. (Spring, alternate years)

242 Solid Waste Disposal (3)
Characteristics of solid waste; collection, transportation, and disposal practices; regional planning and management; resource and energy recovery from solid waste. Prerequisite: approval of Department. (Fall, even years)

243 Environmental Impact Assessment (3)
Public policy and legislation at federal, state, and local levels concerning quality of the environment. Strategies and methodologies that have been developed to assess impact of engineering projects. Technology of assessing impact on air and water quality and on land use, applied to transportation facilities, water supply and pollution control facilities, and industrial and community development. Prerequisite: approval of Department. (Fall, odd years)

250 Advanced Metal Structures (3)
Conception, analysis, and design of low-rise and high-rise buildings by elastic and inelastic methods, suspended roofs, earthquake considerations, and unique structural systems. Prerequisite: CE 201 or equivalent. (Fall)

251 **Advanced Reinforced Concrete Structures** (3)
Conception, analysis, and design of low-rise and high-rise buildings by ultimate strength methods, precast systems, progressive collapse, earthquake considerations, domes, folded plates, shell-type structures and special topics. Prerequisite: CE 202 or equivalent. (Spring)

253 **Failure and Reliability Analysis of Engineering Structures** (3)
Operational and structural failure mechanisms; fracture and fatigue. Operational and structural safety, probability of failure. Aspects of probabilistic structural analysis, statistics of extremes, risk and reliability, optimal design criteria. Reliability of structural systems in design service life; perturbation, Monte Carlo simulation, and proof test methods; inspection and repair maintenance. Prerequisite: ApSc 115 or equivalent. (Fall)

254 **Special Topics in Structural Engineering** (3)
Selected problems in structural mechanics and design: (1) thermal stresses in structural systems, (2) advanced probabilistic structural mechanics, (3) structural design for dynamic loads, (4) structural design for repeated loads, or (5) advanced structural applications. May be repeated for credit. Prerequisite: CE 210 and approval of Department. Topic announced in the *Schedule of Classes*. (As arranged)

255 **Introduction to Ocean and Coastal Engineering** (3)
(Formerly CE 256)
Fundamental aspects of incompressible fluid mechanics and its applications to analysis of wave motions, circulations, and other free surface flows in coastal and offshore regions; wave spectra, water level fluctuations, tides, tsunamis, oscillations, and storm surges; wind-generated waves, including wave statistics and wave spectra; beaches, sediment transport, wave forces on coastal and offshore structures. Prerequisite: ApSc 115 or equivalent. (Fall)

256 **Coastal Processes** (3)
(Formerly CE 255)
Coastal sediment properties and analysis, longshore transport processes and rates; sediment budget; response of beaches to wave action and structures; tidal inlets, mechanical bypassing; beach nourishment; wind transport in sandy dune stabilization, sediment tracing. Prerequisite: CE 255. (Spring, even years)

257 **Harbor and Coastal Engineering** (3)
Applications of principles of ocean and coastal engineering to coastal protection structures, harbor design and navigation, breakwaters, seawalls, quays, docks; sediment transport in the coastal regime, estuaries and deltas; dredging for maintenance of channels and harbors. Prerequisite: CE 255. (Spring, odd years)

261 **Analysis of Plates and Shells** (3)
Bending and stretching of thin elastic plates under loading with various boundary conditions, continuous plates and plates on elastic foundations, theory of folded plate structures. Theory of curved surfaces; general linear bending theory and its simplification to membrane theory; bending stresses in shells of revolution, shallow shell theory. Specific applications. Prerequisite: graduate status. (Spring)

262 **Design of Plate and Shell Structures** (3)
Design of long-span plate and shell roof structures in reinforced concrete and metal; design of containers for fluids and granular materials; computer applications in the analysis of such structures. Prerequisite: CE 201, 202, 261; or equivalent. (Fall, alternate years)

263 **Theory of Structural Stability** (3)
General criteria for stability; buckling of elastic and inelastic columns and frames; torsional and lateral buckling; variational methods. Buckling of

plates and shells under static loads; stability of stiffened structures; effect of imperfections and boundary conditions. Prerequisite: graduate status. (Fall)

265 **Special Topics in Geotechnical Engineering** (3)
Selected topics such as rheology of soils, computer applications, excavating and tunneling, ocean engineering problems, or other special topics. May be repeated for credit. Prerequisite: approval of Department. (As arranged)

266 **Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I** (3)
Nature of dynamic loads in problems arising from earthquakes, tornadoes, hurricanes, and recurring winds. Other natural hazard loading such as floods, expansive soils, storm surges, and tsunamis: characteristics of earthquakes; seismicity, zoning maps, response spectra, wind characterization, and wind tunnel simulation. Use of probabilistic concepts in load determination. Prerequisite: approval of Department. (Spring)

267 **Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards II** (3)
Brief review of natural hazard loadings and random formulation; earthquake and wind design considerations and procedures; review of code requirements and specifications; balanced risk approach for natural hazards; cost effectiveness of integrated natural hazard design; special problems. Prerequisite: CE 266 or approval of Department. (Fall)

271 **Theoretical Marine Hydromechanics** (3)
Introductory course. Derivation of the fundamental equations and boundary conditions of fluid media; application of potential-flow theory to fluid motion around two- and three-dimensional bodies; perturbation concepts. Introduction to thin-ship and slender-body theories. Derivation of force and movement of bodies in calm and disturbed water. Prerequisite: approval of Department. Offered off-campus only. (As arranged)

272 **Biological Wastewater Treatment** (3)
Applications of principles from CE 240 and CE 241 to biological treatment. Nitrification/denitrification, biological phosphorous removal, oxidation ditches, and sequencing batch reactors. Prerequisite or concurrent registration: CE 241. (Spring, even years)

273 **Water Supply Engineering** (3)
Quantity and quality aspects of water supply engineering are discussed. Topics include reservoir sizing, groundwater, distribution systems, treatment processes and chemistry of waters. Prerequisite or concurrent registration: CE 240. (Spring, odd years)

274 **Mechanics of Water Waves** (3)
Irrotational theory for deep- and shallow-water waves, reflexion, refraction, diffraction, attenuation. Water waves of finite amplitude: shallow-water theory, tides, bores, long-waves theory, conoidal and solitary waves. Wave generation by wind, state of the art based on correlation between theory and measurements. Wave breaking and reflexion. Prerequisite: ApSc 213 or equivalent and permission of instructor. (Fall, even years)

275 **Special Topics in Ocean Engineering** (3)
Selected topics: (1) marine aspects of viscous-flow theory, (2) interfacial (internal) waves, (3) applied random processes in ocean and coastal engineering, or (4) other selected topics. May be repeated for credit. Prerequisite: approval of Department. (As arranged)

276 **Water Resources Planning and Control** (3)
The parameters of water resources planning and control; economics of water resources and related natural resources; economics of water quality control; physical parameters of water resource development; water resources law. Prerequisite: approval of Department. (Fall, even years)

277 **Industrial Waste Treatment** (3)
The nature of industry and waste generation; industrial waste characteristics; waste measurements; techniques utilized in industrial waste treatment and control; nuclear waste control; reuse of industrial effluents and sewage for industrial process water; problems associated with treatment sewage for industrial process water and disposal of industrial wastes and their effects on receiving waters. Prerequisite or concurrent registration: CE 240. (Fall, odd years)

278 **Pollution Transport System** (3)
Distribution of pollutants in natural waters and atmosphere; diffusive and advective transport; mathematics for stream pollutant deoxygeneration rates; groundwater pollution transport; sediment transport; thermal transport; numerical simulation of pollutant transports in streams and estuaries. Prerequisite: CE 193, ME 131. (Fall, even years)

280 **Water Resources Systems** (3)
Water resources planning and control; water quality planning, water supply planning, comprehensive planning and management. Case studies of systems. Prerequisite: CE 276. (Spring, odd years)

281 **Special Topics in Water Resources** (3)
Morphometric properties of drainage basins; drainage network analysis; hydraulic geometry of streams; advanced hydraulics of alluvial channels; modeling of drainage basins; computer applications; stochastic hydrology. Prerequisite: approval of Department. (As arranged)

282 **Hydraulic Modeling** (3)
Dimensional analysis and similitude. Types of models; physical, mathematical. Distortions in physical models. Erodible bed models. Prerequisite: CE 193. (Fall, alternate years)

283 **Special Topics in Environmental Engineering** (3)
Selected topics, such as Public Health Engineering, Sludge Treatment and Disposal, Advanced Chemistry for Environmental Engineers. (As arranged)

298 **Research** (arr.)
Basic research projects, as arranged. May be repeated for credit. (Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

310 **Sedimentation Engineering** (3)
Problems of erosion and sedimentation. Properties of sediment. Initiation of motion. Suspension of sediment and sediment discharge theories. Sedimentation measurements. Economic and legal aspects. Prerequisite: CE 212 or approval of Department. (Fall, odd years)

311 **Mechanics of Alluvial Channels** (3)
Physical processes in drainage basins and channels. Channel forms and bed forms. Hydraulics and sediment transport in alluvial channels. Design of stable channels. Qualitative and quantitative response of rivers. Channel stabilization, navigation channels. Case studies including environmental impacts. Prerequisite: CE 212 or approval of Department. (Spring, odd years)

312 **Advanced Hydraulics** (3)
Continuity, energy, and momentum equations. Turbulence, diffusion, and dispersion. Cavitation, waves, subsurface flow. Special problems in flow through hydraulic and marine structures. (Spring, even years)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)

Mechanical Engineering Graduate Courses

Courses designated as "As arranged" are not offered on a regular basis. An asterisk indicates that a course is offered at NASA–Langley Research Center and may be offered on campus when arranged.

204 **Advanced Instrumentation Techniques** (3)
Pressure and temperature sensors; shadowgraph, schlieren and interferometer systems; laser holography; laser doppler velocimetry; signal conditioning, use of amplifiers with shielding and grounding techniques; digital techniques; signal multiplexing; use of computers; error analysis and data handling. Lecture and laboratory. Prerequisite: approval of Department. (Fall)

216 **Structural Dynamics** (3)
Methods of solving vibration problems: differential equation, Rayleigh–Ritz finite element. Free and forced vibration of structural components: straight, curved, and thin-walled beams; plates and shells; sandwich construction. Vibration of built-up structures. Structural wave motion, wave motion in periodic structures. Prerequisite: ME 215. (As arranged)

218 **Design of Floating and Submerged Marine Vehicles** (3)
Consideration of interaction between hydrodynamics, propulsion, and configuration aspects of design of floating structures and vehicles; effects of submergence and deep submergence; hydrofoil and vertical jet action; structural considerations. Prerequisite: EngS 228. (As arranged)

221 **Intermediate Fluid Mechanics** (3)
The continuum, kinematics of fluids; stress tensor, strain and rate-of-strain tensor; fundamental equations of the flow of viscous compressible fluids; Laplace's equations; source, sink, and doublet; vortices, Biot-Savart theorem and the flow field of a vortex; spherical and cylindrical harmonics; methods of singularity distributions, complex-variable methods; laminar flow of viscous incompressible fluids; boundary-layer concept. Prerequisite: approval of Department. (Fall)

222 **Applied Fluid Dynamics** (3)
Subsonic lifting line wing theory, direct and inverse solution of the lifting surface theory; singularity method for wing–body combination; vortex lift theory; effects of camber and twist distribution; transonic airfoils, effect of wing sweep, area ruling concept; supersonic linearized wing theory; similarity rules. Prerequisite: ME 221 or equivalent. (As arranged)

224 **Fundamentals of Combustion Engines** (3)
Classification of combustion engines. Air cycles, vapor cycles, external combustion engines, internal combustion engines; rotary engines, reciprocating engines, and turbomachinery; ideal cycle analysis; engine heat losses and friction; practical cycle analysis, status of computerized cycle analysis; combustion and knocking; carburetion and fuel injection; mixture distribution; valve mechanism; ignition systems; combustion chamber; piston-engine, rotary-engine, and turbomachinery mechanics and balance. Prerequisite: approval of Department. (As arranged)

225 **Turbomachinery I** (3)
Turbine, compressor, and pump types and uses; dimensional analysis of turbomachines; cycle analysis of gas and steam turbines; energy interchange in fluid machinery; design, characteristics, and performance of turbines, compressors, and pumps; comparison of types of turbines, compressors, and pumps. Prerequisite: ME 221. (Fall)

226 **Turbomachinery II** (3)
Aerodynamics of aerofoils, flow in cascades, axial compressor aerodynamic design, axial turbine aerodynamic design, compressor and turbine matching. Combustion fundamentals, combustion chemistry, and gas turbine combustion chamber design. Prerequisite: ME 225. (Spring)

227 **Viscous Flow** (3)
Exact solutions of Navier–Stokes equations; the small Reynolds number approximations, laminar boundary-layer theory and techniques for its solution, stability of laminar flows; Reynolds theory of turbulent stresses, applications to internal and external flows, turbulent boundary-layer theory; applications to heat transfer problems; flow separation. Prerequisite: ApSc 213; ME 221 or equivalent. (Fall)

231 **Hydrodynamics** (3)
Flow at large Reynolds number: vorticity dynamics, Kelvin's theorem in inviscid flow, vorticity in motions generated from rest, boundary layers, applications of the momentum theorem. Irrotational flow theory: applications of Bernoulli and momentum theorems to steady flows, flow due to a rigid body, two-dimensional motion and applications of complex variable theory, free surface flows, Froude numbers, criterion of dynamic similarity. Effectively inviscid flow with vorticity: sheet vortex, flow with swirl, vortex system of a wing. Prerequisite: ME 221 or equivalent. (Spring)

*233 **Aeroelasticity I** (3)
(Formerly ME 223)
Classification of combustion engines. Air cycles, vapor cycles, external combustion engines, internal combustion engines; rotary engines, reciprocating engines, and turbomachinery; ideal cycle analysis; engine heat losses and friction; practical cycle analysis, status of computerized cycle analysis; combustion and knocking; carburetion and fuel injection; mixture distribution; valve mechanism; ignition systems; combustion chamber; piston-engine, rotary-engine, and turbomachinery mechanics and balance. Prerequisite: approval of Department. (As arranged)

*234 **Aeroelasticity II** (3)
Brief review of potential-flow theory. Steady and oscillating three-dimensional planar and nonplanar lifting surfaces in subsonic and supersonic flow—theoretical and numerical development (acceleration potential, velocity potential), continuous-load and discrete-load methods, wings with deflected or oscillating control surfaces. General time-dependent motion of arbitrary configurations in subsonic and supersonic flow. Transonic unsteady aerodynamics of three-dimensional lifting surfaces. Dynamic response of aircraft to atmospheric turbulence. Aeroelasticity in structural design. Prerequisite: ME 233. (As arranged)

235 **Compressible Flow** (3)
Thermodynamics and physical properties of gases, fundamental equations of a compressible inviscid fluid, small perturbation theory, expansions in Mach number and thickness parameters, second-order shock shapes, role of entropy in supersonic flow, shock wave interactions, holograph transformation, Kármán-Tsien and other model gases, conical flows, transonic flow theory, method of characteristics, rotational nonisentropic flows. Prerequisite: ApSc 213; ME 221 or equivalent. (Spring, even years)

237 **Energetics of Fluid Flow I** (3)
Classification of fluids; criteria for identifying flow regimes, i.e., continuum, rarefied, relativistic, and quantum flows. Dimensional analysis and similitude. Derivation of species conservation equations; derivation of conservation equations when external body forces are applied, e.g., magnetofluidmetion equations when

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chanics. High-speed chemically reacting flows, i.e., aerothermochemistry. Introduction to computational fluid dynamics. Prerequisite: ApSc 213, ME 221. (Spring, odd years)

238 **Energetics of Fluid Flow II** (3)
Nonsteady flows. Application of theories presented in ME 237 to advanced energy conversion devices and processes. Approaches to improving the performance of energy devices, chosen by their technological timeliness and/or students' interests. Prerequisite: ME 237. (As arranged)

240 **Kinematic Synthesis** (3)
Techniques for the analysis and synthesis of function, path, and motion generating mechanisms. Algebraic and graphical methods for the dimensional design of mechanisms having prescribed performance characteristics. Design for higher-order requirements. Computer-aided techniques for the optimal design of planar linkages using Burmester theory, complex number stretch-rotation operators, Chebyshev polynomials, etc. Review of recent developments and current research. Term project. Prerequisite: ME 190 or equivalent. (Spring, even years)

241 **Engineering Systems Design** (3)
Principles of systems design; interdisciplinary system simulation for mechanical, electrical, fluid, and thermal sciences; dynamic response of systems; mathematical model and analogy studies; optimization techniques with computer-aided solutions. Prerequisite: approval of Department. (Fall, even years)

242 **Advanced Mechanisms** (3)
Emphasis on spatial kinematics but with some attention to classical theorems of plane kinematics. Analysis and synthesis of mechanisms. Analytical techniques using matrices, dual numbers, quaternion algebra, finite and instantaneous screws, theory of envelopes. Applications to design of linkages, cams, gears, machined surfaces. Use of digital computers in mechanism analysis and design. Prerequisite: ME 240. (Spring, odd years)

243 **Advanced Mechanical Engineering Design** (3)
Design of mechanical engineering systems, components, and equipment; requires the integration of engineering disciplines at an advanced level. Prerequisite: approval of Department. (Fall, odd years)

246 **Electromechanical Control Systems** (3)
Advanced techniques for system synthesis, compensation, and stabilization. Linear and nonlinear characterization of mechanical, electromechanical, and electronic control components. Time domain analysis and synthesis using state space methods and matrix differential equation techniques. Introduction to digital control theory and its applications. Prerequisite: ME 182 or equivalent. (Fall)

*248 **Seminar: Aircraft Design I** (3)
Designing an aircraft to specifications. Regulatory requirements, state-of-the-art limitations, computer-aided design, integration of aircraft components, economic considerations, and iterations to final configuration to obtain specified mission profile. Prerequisite: approval of Department. (As arranged)

*249 **Seminar: Aircraft Design II** (3)
Aircraft design in relation to prescribed mission requirements, different configurative concepts, detail design features. Estimation of weight, size, and power of an aircraft to satisfy mission specifications; design trade-offs and compromises. Emphasis on subsonic aircraft for steady cruising flight missions. Jet-powered and propeller-driven aircraft; supersonic cruising aircraft. Prerequisite: approval of Department. (As arranged)

*Offered at NASA–Langley Research Center but may be offered on campus when arranged.

255 **Urban Transportation Technology** (3)
Introduction to technical evaluation of alternative transportation modes including bus, rail, and new technology. Includes system operations, energy and environmental impacts, route constraints, suspension and switching systems, life-cycle costs, and measures of system effectiveness. Prerequisite: approval of Department. (As arranged)

257–58 **Energy Technology I and II** (3–3)
Application of multifarious energy analytic techniques to a variety of energy systems, devices, and processes. Solar photovoltaics, fuel cells; tidal, geothermal, wind energy conversion; controlled thermonuclear fusion and magnetohydrodynamics. Synthesis of fuels and structural aspects of electric utilities and their relation to decentralized energy. Coupled issues, such as food/energy, population/energy, and transportation/information. Analytical methods applied to these technologies: hands-on machine literature searching; supply and demand forecasting, including Delphi, scenario writing, linear and multiple statistical regression analysis; data interpretation of extremal statistics applied to the design of wind electric generators; input/output analysis; net energy analysis; life-cycle costing; second law (exergy) analysis; technological assessment; mathematical modeling of energy systems and computer-assisted synthesis (CAS). It is recommended that ME 257–58 be taken in sequence. Prerequisite: approval of Department. (Academic year)

259 **Solar Heating Systems** (3)
Fundamentals of solar radiation; methods of solar energy collection and storage. Theory of flat-plate collectors, solar energy system analysis, design of solar water heating and space heating systems, economics of solar heating systems. Passive solar heating systems. Solar industrial process heat. Prerequisite: ME 187 or equivalent. (Fall)

260 **Heating and Air Conditioning of Buildings** (3)
Basic concepts and engineering data including psychometrics and comfort conditions. Heating and cooling load calculations, computer programs for system design and for energy consumption analysis. Codes and standards for building energy management, energy conservation opportunities. Heating and air conditioning systems; all air, air and water, all water, and central control systems. Cost estimates and economic analyses, life-cycle costing. Prerequisite: ME 187 or equivalent. (Spring)

261 **Air Pollution I** (3)
Introductory course on the generation, monitoring, and control of air pollution. Atmospheric pollutants; current levels and health problems. Combustion chemistry and mixing. Application to automobile and power plant controls. Photochemical processes; smog and measurements. Atmospheric dispersion; inversion and acid rain. Prerequisite: approval of Department. (Fall)

262 **Air Pollution II** (3)
Current and future trends in the design of nonpolluting automotive sources. Atmospherics of pollution diffusion and long-term chemical evolution. Weather interaction. Diagnostic techniques and remote sensing. Air pollution standards. Noise control. Prerequisite: ME 261 or equivalent. (Spring)

264 **Air Pollution Seminar** (3)
Special interest and advanced topics not covered in ME 261 or 262. Special lectures by individual experts. Participants are required to conduct a special topic study for contribution to the seminar. Prerequisite: approval of Department. (As arranged)

267 **Power Plant Pollution Control** (3)
The control of existing emissions from stationary sources. Aerosol controls; sedimentation, precipitation, filtration, and wet collection. Application of scrubbers, catalysts, and combustion modification to control of gaseous emissions from stationary sources. Special techniques for fine particulate control (fabric, electrostatics). Waste disposal. Alternative power systems and future design concepts. Thermal pollution. Prerequisite: ME 261 or equivalent. (Fall)

*269 **Wind Tunnel Research Techniques** (3)
A comprehensive survey of wind tunnel research facilities and techniques; subsonic, transonic, supersonic, and hypersonic facilities; basic principles of wind tunnel design; associated research equipment including models, balances, instrumentation, and flow visualization techniques; data acquisition and reduction; research methods; static and dynamic testing techniques; powered-model testing; typical research data; significant research contribution. Prerequisite: approval of Department. (Spring)

*270 **Aerodynamics of Flight Vehicles** (3)
Aerodynamic loads on flight vehicles, interference effects, application of aerodynamic theory to aircraft design, studies of aircraft dynamics and performance. Prerequisite: ME 222 or equivalent. (Spring)

*271 **VTOL Aircraft Technology** (3)
Fundamental principles of VTOL aircraft; hovering performance based on momentum theory; analysis of jet-induced interference effects; transition aerodynamics; theoretical stability and control and correlation with flight data; ground-effect theory and experiment; handling-qualities criteria; elements of instrument approach and landing problem. Prerequisite: approval of Department. (Spring)

*272 **Powered-Lift Technology** (3)
Basic principles of powered-lift aircraft; high-lift aerodynamics; low-speed stability and control; fundamentals of internally blown and externally blown powered-lift concepts; the spanwise blowing scheme to delay wing stall; use of powered-lift for improved maneuverability of fighter aircraft; aerodynamic ground effects; alleviation of noise of powered-lift systems; aerodynamic loads associated with blown flaps. Prerequisite: approval of Department. (Fall)

*273 **Principles of Automatic Flight Control** (3)
Design of aeronautical instrumentation and feedback controls; mathematical models of sensors, controllers, and actuators; theory of feedback control, stability, accuracy, and speed of response; equalization effects of nonlinearities and noise. Prerequisite: approval of Department. (Spring)

*274 **Principles of Flight Guidance** (3)
Guidance requirements for atmospheric flight; implementation of guidance systems using inertial and radio techniques in conjunction with automatic data processing. Prerequisite: ME 273. (Fall)

275 **Stability and Control of Vehicles** (3)
Derivation of equations of motion, Euler transformations and direction cosines, stability derivatives and linearization of equations of motion, stability of linear systems with application to longitudinal and lateral dynamics, Laplace transform techniques, and frequency response analysis. Prerequisite: approval of Department. (Fall)

*276 **Mechanics of Space Flight** (3)
First- and second-order Hamilton–Jacobi perturbation theory applied to artifical satellites, von Zeipel's methods, special and general perturbation theories for third-body perturbations. Differential correction of orbits by weighted least squares and minimum variance techniques. Comparison of

*Offered at NASA–Langley Research Center but may be offered on campus when arranged.

various filtering techniques as applied to orbit determination and other space flight parameter estimation. Prerequisite: approval of Department. (As arranged)

277 **Numerical Methods in Fluid Mechanics** (3)
Numerical solution of partial differential equations of fluid flow; finite-difference techniques for viscous and inviscid flows; stability; methods of characteristics; boundary conditions; applications in subsonic and supersonic flows. Prerequisite: ApSc 213, EngS 284; or equivalent. (As arranged)

*279 **Special Topics in Flight Sciences** (3)

280 **Intermediate Thermodynamics** (3)
Macroscopic and microscopic descriptions of thermodynamic systems. Fundamental equation; conditions of equilibrium and stability of thermodynamic systems. Review of methods of statistical thermodynamics, microstate, macrostate, and thermodynamic probability. Classical and quantum statistics. Properties of perfect gases and crystals. Review of elements of kinetic theory and transport phenomena. Chemical equilibrium and selected applications. Prerequisite: approval of Department. (Fall)

281 **Nonequilibrium Thermodynamics** (3)
Equations of state and potential functions. Criteria of nonequilibrium processes. Comparison of nonequilibrium process approaches, i.e., thermodynamic and rational mechanics. Constitutive relations. Onsager's reciprocity relations. Nonlinear transport and coupled transport phenomena. Prigogine's diagram technique. Prerequisite: ME 280 or equivalent. (Spring, odd years)

283 **Nuclear Reactor Engineering I** (3)
World energy resources and the importance of fission energy; atomic and nuclear structure; nuclear fission and chain reaction; critical mass; nuclear reactor classification; history of reactor development; nuclear reactions and radiations; radioactive decay; radiation detection, hazards, and protection; neutron reactions; neutron diffusion and slowing down; the criticality condition; reflected reactors; homogeneous and heterogeneous reactor systems; transient reactor behavior and control; description of pressurized and boiling water reactors; other reactor systems. Environmental considerations; reactor safety. Prerequisite: approval of Department. (As arranged)

284 **Nuclear Reactor Engineering II** (3)
Energy removal; reactor coolants; reactor thermal hydraulics, radiation damage and reactor material problems; reactor fuels; shielding; mechanical and structural components; preliminary reactor design; fuel cycles; description of nuclear reactor systems; engineered safety systems; the economics of nuclear power. Prerequisite: ME 283. (As arranged)

*285 **Reaction Kinetics** (3)
Theoretical aspects of kinetics of homogeneous and heterogeneous reactions in gaseous and liquid systems. Prerequisite: ME 280. (As arranged)

286 **Special Topics in Mechanical Engineering** (3)
Prerequisite: approval of Department. (As arranged)

287 **Heat Conduction** (3)
Conduction of heat through solid, liquid, and gaseous media; formulation and methods of analytical, numerical, and analog solutions; steady two- and three-dimensional problems, problems in unsteady heat conduction; conduction in composite regions. Prerequisite: ApSc 213 or equivalent. (Fall, odd years)

*Offered at NASA–Langley Research Center but may be offered on campus when arranged.

288 Convective Heat and Mass Transfer (3)
Heat and momentum transfer in laminar and turbulent flow; application of boundary-layer theory to problems of forced convection; the laminar boundary-layer and similarity solutions; heat convection in turbulent flow, momentum-heat transfer analogy; the influence of temperature-dependent fluid properties; convective heat transfer at high velocities; mass transfer; formulation of a simplified theory; some solutions to the conserved property equation. Prerequisite: ME 221 or equivalent. (Spring, even years)

289 Radiative Heat Transfer (3)
Nature of thermal radiation; laws of intensity attenuation and generation; solid angles and frequency spectrum: flames, solar ponds, beam energy transmission; surface properties and view factors: design of furnaces and radiant boilers; radiation vs. convection processes: reentry, lasers. Applications to optical temperature diagnostics; emission, absorption, and scattering techniques; remote sensing. Prerequisite: approval of Department. (Fall, even years)

***290 Kinetic Theory of Gases** (3)
Equation of state and physical properties for gas composed of discrete particles; relation of kinetic theory to thermodynamics; Maxwell distribution of molecular velocities; Boltzmann H theorem. Molecular interactions, free paths, collision rates, scattering coefficients. Introduction to diffusion, viscosity, heat conduction; imperfect gases; flow of gases at low density. Prerequisite: ME 280. (As arranged)

291–92 Power Systems (3–3)
Design of thermal power system components and system optimization. Steam-cycle power generation system components: steam generators, reactor coolant system, condensate and feedwater system, turbine-generator, waste heat removal. Heat balance studies, options for improved cycle efficiencies, system optimization studies, component selection and design, cooling towers, lakes and ponds. Review of safety and pollution regulations; testing, inspection, and codes. Survey of electric power system technology. Prerequisite: ME 148, 187; or equivalent. (Academic year)

293 Combustion (3)
Basic combustion phenomena. Rate processes and chemical kinetics. Chain reaction theory. Detonation, deflagration, diffusion flames, heterogeneous combustion. Combustion technology, computer modeling, and experimental measurements. Impact of pollution regulations and alternate fuels. Prerequisite: approval of Department. (Spring, even years)

295 Statistical Thermodynamics (3)
Distribution functions; Boltzmann, Bose–Einstein, and Fermi–Dirac statistics; partition functions, correspondence between classical and statistical thermodynamics. Systems with negligible effects of interparticle forces: perfect gases, perfect electron gas, photon gas. The Debye solid, the Einstein solid. Prerequisite: ME 280. (Spring, even years)

296 Special Topics in Heat and Mass Transfer (3)
Prerequisite: approval of Department. (As arranged)

297 Special Topics in Fluid Mechanics (3)
Prerequisite: approval of Department. (As arranged)

298 Research (arr.)
Research as arranged. May be repeated for credit. (Fall and Spring)

299–300 Thesis Research (3–3)
(Fall and Spring)

310 Mechanics of Non-Newtonian Fluids (3)
Classification of fluids; physical properties of composite fluids; convected coordinate systems; fundamentals of constitutive equations of composite

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fluids; purely viscous fluids, Reiner and Rivlin theories, power-law fluids; linear theory of viscoelastic fluids, Boltzmann principle, quasi-linear viscol elasticity; nonlinear theory of viscoelasticity, Rivlin–Ericksen theory; visco-plastic fluids, Bingham plastic fluids, Oldroyd's analysis; viscometry and rheogoneometry; turbulent flow of suspensions and emulsions in pipes; fractional drag reduction by polymeric additives. Prerequisite: approval of Department. (As arranged)

311 **Nonsteady Flow** (3)
Eulerian and Lagrangian kinematics. Fundamental equations of nonsteady viscous flow. Characteristics and waves; initial and boundary conditions. Piston theory and the oscillating airfoil. Nonsteady flows with entropy production. Discontinuities, interactions, and special transients. Gas dynamics of nonsteady combustion. Analogies and applications. Prerequisite: ME 235 or 237, or equivalent. (As arranged)

312 **Theory of Turbulence** (3)
Concept of turbulence, transition and linear theory of flow stability, experimental observations on turbulence generation, turbulent kinetic energy distribution, statistical description of turbulence, energy cascade and energy spectrum in turbulence, mean turbulent energy and Reynolds stress closure models, turbulent shear flows in free turbulence and wall turbulence, turbulence in atmospherical environment and effects on air-pollution and weather systems, turbulent drag reduction. Prerequisite: ME 227. (As arranged)

313 **Magnetofluidmechanics** (3)
Thermodynamics and fluid mechanics of electrically conducting liquids and gases; theory and applications; thermodynamics and transport properties of plasmas formulated; reaction kinetics and plasma reactions; fundamental equations (mass, momentum, and energy) of magnetofluidmechanics; flow with infinite and finite conductivity, Alfven waves and wave phenomena, flow with heat transfer and friction, relativistic magnetofluidmechanics, dimensional analysis and scaling parameters, applications to MHD power generators, pumps, plasma jets and propulsion, controlled thermonuclear fusion, chemical synthesis and mineral separation. Prerequisite: ME 221, 280. (As arranged)

315 **Hypersonic Flow** (3)
Shock waves in hypersonic limits, one-dimensional piston problem, and method of characteristics. Hypersonic small disturbance theory and exact solutions. Unsteady analogy and similarity parameters. Newtonian flow theory for slender and blunt bodies. Tangent wedge/cone approximation and shock expansion theory. Delta wing problems. Hypersonic viscous interaction phenomena and real gas effects. Features of hypersonic boundary layers and local similarity approximations. Prerequisite: ME 235; ApSc 211, 212. (As arranged)

317 **Physical Gas Dynamics** (3)
Molecular and atomic phenomena in gases, intermolecular forces, specific heats, equation of state for a real gas, dynamics of dissociating gas, radiation. Prerequisite: ME 235, 295 or equivalent. (As arranged)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)

Engineering Science Graduate Courses

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201 **History of Technology I** (3)
The characteristic technologies of Prehistory, the Ancient Near East, Greece and Rome, Byzantium and Islam, and Christian Europe. Technology is broadly defined. Emphasis is on its manifold interactions with other cultural forces. (As arranged)

*202 **Advanced General Metrology** (3)
Topics in the conceptual, physical, and mathematical aspects of measurement, standards, design for precision measurement, and measurement at extreme values. Prerequisite: graduate status. (As arranged)

*203–4 **Probability and Statistics of Metrology** (3–3)
Probability distributions, discrete and continuous distributions; sampling; combinatorial analysis; stochastic processes; conditional probability; correlation; analysis of variance; design and analysis of experiments; Latin square experiments; factorial experiments; block and lattice design. Prerequisite: ApSc 115 or equivalent. (As arranged)

206 **Technology and Human Needs** (3)
Sociology of science and engineering. Social consequences of modern technology, including energy systems, environmental issues, transportation, communications biomechanics, and the use of computers in conjunction with it. Institutional barriers and incentives to socioeconomic progress made possible by high technology. Prerequisite: approval of Department. (As arranged)

207 **Engineering Climatology** (3)
Constitution of physical properties of Earth and atmosphere, stability conditions, energy balance characteristics, atmospheric motions, storm forecasting models, tree-ring analysis, evaporation, precipitation, fog formation, soil moisture, ground frost. Prerequisite: approval of Department. (As arranged)

208 **Energy Conservation** (3)
Methods of conserving energy without sacrificing productivity and the quality of life. Conservation methods in the home, in transportation, and in industrial, manufacturing, and commercial sectors. Second law of thermodynamics from a conservation viewpoint. Construction methods for low-energy consumption in large and small edifices. Environmental effects and low-fuel consumption in ground and air transportation. Greenhouses and natural fertilizers. Prerequisite: approval of Department. (As arranged)

210 **Quantitative Aspects of Social Phenomena** (3)
Mathematical models presenting social phenomena. Historical review of attempts to quantify social phenomena. Comparison of deterministic and stochastic analysis. Population growth; birth and death rates; population diffusion; Lancaster equation; Richardson's approach; the Forrester–Meadows model. Kinetic theory formulation of peaceful co-existence. Probability distributions, characteristic functions, and central limit theorem. Brownian motion approach to speculation and the stock market. Traffic flow, the statistical approach and Lighthill's method. Quality-of-life indicators and quantification of social indicators. Environmental modeling. Thermodynamic approach to self-rejuvenating systems and its application in government and organizations. Prerequisite: approval of Department. (As arranged)

212 **Nonrenewable Resources** (3)
Nonrenewable fossil and fissil fuel resources. The interplay of geology, engineering applications, and economics. Fossil fuels include coal, petro-

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leum, natural gas, shale; fissil fuels include uranium and thorium. Exploration, excavation, production, and processing. Conversion techniques from solid to liquid and gaseous fuels. Environmental impacts and supply/demand issues. Prerequisite: ME 257 or approval of Department. (As arranged)

213 **Renewable Resources** (3)
Renewable energy resources, or those believed to be of practically indefinite duration. Solar energy aspects, excluding solar heating of buildings. Biomass, including food, fiber, and photosynthesis. Biological and chemical processes, pyrolysis, enzymatic hydrolysis, and hydrogenation. Solar photovoltaics, wind energy conversion systems, ocean thermal energy conversion, tidal energy, geothermal energy. Central vs. distributed energy systems. Prerequisite: ME 257 and 258 are desirable, or approval of Department. (As arranged)

214 **Geothermal Energy** (3)
Geothermal energy due to thermal gradients in the earth, fundamentals of geological gradients, geographic location of potential geothermal energy sources, comparison of methods of exploration and study of steam and hot rock systems. Generation of electricity from geothermal sources. Obtaining hot water process heat. Equipment design. Environmental effects and means of mitigating adverse conditions. Prerequisite: approval of Department. (As arranged)

215 **Advanced Strength of Materials** (3)
Deflection of beams using singular functions, unsymmetrical bending of beams, beams on elastic foundation, beam-column problems, shear center for thin-wall beam cross-sections, curve beams, applications of energy methods, torsion, basic equations for theory of elasticity, thin- and thick-wall cylinders, stress concentration, failure criteria and elastic–plastic analysis of beams under bending and torsion. Prerequisite: CE 120. (Spring)

217 **Analytical Mechanics** (3)
Fundamental principles, generalized coordinates, variational principles and Lagrange's equations, nonholonomic systems, Hamilton's equations, theory of small oscillations. Prerequisite: approval of Department. (As arranged)

218 **Introduction to Continuum Mechanics** (3)
Kinematics of a continuum, equations of motion, linear isotropic elastic solid, Newtonian viscous fluid, integral formulation of general principles, simple applications. Prerequisite: approval of Department. (Fall)

221 **Theory of Elasticity I** (3)
Review of basic concepts and equations, formulation of boundary value problems, variational principles, general torsion and bending of prismatical rods, solution of plane problems using complex analysis. Prerequisite: ApSc 211, EngS 215 or 218. (Spring)

222 **Theory of Elasticity II** (3)
Three-dimensional elastostatics, thermoelasticity, and introduction to elastic wave propagation. Prerequisite: EngS 221. Prerequisite or concurrent registration: ApSc 215. (Fall, odd years)

228 **Physical Oceanography** (3)
Seawater, equations of motion, interaction between air and sea, currents, wind-waves in deep and shallow waters, long ocean waves, tides, wave statistics, sea ice. Prerequisite: ME 221 or equivalent. (As arranged)

229 **Transformations in Materials** (3)
Thermodynamics of solids, statistical interpretation of entropy, lattice defects, equilibrium in multicomponent systems, rate theory, diffusion, phase transformations, nucleation and growth, precipitation, martensitic transformations. Prerequisite: CE 140 and ME 280. (Spring, odd years)

230 Deformation of Materials (3)
Dislocation geometry, stress field of dislocations, forces on a dislocation, dislocation reactions, dislocation dynamics, yield, plastic flow, work hardening, recovery, solid solution hardening, precipitation and dispersion hardening. Prerequisite: CE 166 and EngS 218. (Fall, odd years)

231 Structure of Materials (3)
Crystal structures, theory of metals, crystal energy, covalent bonding, metallic bonding, quantum theory of metals, insulators, semiconductors, magnetism, superconductivity, dislocation point defects, solid solutions, precipitates, second phases, structure of real materials. Prerequisite: CE 140. (Fall, even years)

233 Mechanics of Composite Materials (3)
Stress–strain relationship for orthotropic materials; invariant properties of an orthotropic lamina; biaxial strength theory for an orthotropic lamina; mechanics of materials approach to stiffness; elasticity approach to stiffness; classical lamination theory; strength of laminates; statistical theory of fatigue damage for composites. Prerequisite: approval of Department. (Spring, odd years)

234 Composite Materials (3)
Principles of composites and composite reinforcement; micromechanics and failure; interface reactions in various composites; reinforcing materials: structure of composites—fiber-reinforced polymers, filler-reinforced polymers, fiber-reinforced metals, directionally solidified alloys, dispersion-strengthened metals. Prerequisite: approval of Department. (Spring, even years)

236 Experimental Techniques in Materials Science (3)
Sample preparation. Optical microscopy including polarized light methods, phase contrast, interferometry. X-ray diffraction including Laue technique and Debye-Scherrer method. Electron probe microanalysis. Electron microscopy including electron optics, image formation and contrast for scanning and transmission electron microscopy. Field ion microscopy. Prerequisite: EngS 231. (Spring, odd years)

237 Environmental Effects on Materials (3)
Aqueous corrosion, electrochemistry, electrochemical reactions, polarization, environmental factors, intergranular corrosion, stress corrosion, high temperature corrosion, kinetics and mechanisms of corrosion, oxidation, liquid metal corrosion, irradiation effects. Prerequisite: approval of Department. (Fall, even years)

***239 Physical Ceramics** (3)
Crystal chemistry and the systematic study of the structure of ceramic materials; solid reactions occurring at elevated temperatures; sintering vitrification, diffusional mechanisms and effects; reaction rate theory; elastic, anelastic, and plastic properties of ionic and covalent solids; viscoelastic behavior of vitreous and vitreous-solid systems; phase equilibria of ceramic systems. Prerequisite: approval of Department. (As arranged)

240 Fracture Mechanics (3)
Fundamentals of brittle fracture, Griffith theory and extensions, mechanics of fracture, linear elastic systems, plasticity considerations, fracture toughness, engineering analysis, notch strength analysis with limit approach, crack propagation laws, fatigue, fracture testing, comparison of recent continuum theories. Prerequisite: EngS 221 or CE 261. (Spring, even years)

241 Failure of Materials (3)
Tensile and shear deformation, yield, dislocation motion, geometry of slip, single and polycrystal deformation, twinning, creep deformation, polymer

*Offered at NASA–Langley Research Center but may be offered on campus when arranged.

deformation, fracture, Griffith theory, fracture toughness, transition temperature, microstructure effects, environmental effects, stress corrosion cracking, cyclic stress and strain, fatigue crack initiation and propagation, statistical analysis, low cycle fatigue, failure analysis. Prerequisite: CE 166. (Fall, odd years)

242 **Materials Recycling and Recovery** (3)
Techniques and technologies for recovering and reusing waste materials and developing low-resource waste systems. Direct relationships of recycling and waste reduction to energy conservation. Effect of recycling on energy and environmental impacts of alternative materials and products; legal, economic, institutional, and environmental policy aspects of recycling and waste reduction. Prerequisite: approval of Department. (As arranged)

249 **Special Topics in Materials Science** (3)
Prerequisite: approval of Department. (As arranged)

256 **Introduction to the Theories of Inelastic Media** (3)
Physical basis of anelasticity, viscoelasticity, plasticity, and viscoplasticity; constitutive equations of elastic and viscoelastic media; foundations of the theories of plasticity and viscoplasticity; boundary-value problems and wave propagation in inelastic media. Prerequisite: ApSc 213 or equivalent and approval of Department. (Spring, odd years)

257 **Theory of Vibrations**
(formerly ME 215)
Damped and undamped natural vibration, response of single- and multiple-degrees-of-freedom systems to steady-state and transient excitations, modal analysis, nonproportional damping and complex modes, variation formulation of equations of motion, discretization of structural systems for vibrational analysis. Prerequisite: approval of Department. (Fall)

259 **Random Vibration of Structures** (3)
Introduction to random processes; responses of linear structures to stationary and nonstationary random inputs; structural responses to earthquakes, waves, boundary-layer turbulences, wind loads, etc.; failure analysis of structures under random loads; first passage failure, fatigue, stress-corrosion and crack propagation under random stress histories. Prerequisite: ApSc 115 or CE 253. Prerequisite or concurrent registration: CE 252 or ME 215. (Spring, even years)

260 **Random Process Theory in Engineering** (3)
Spectral analysis, linear system, the superposition principle; statistical prediction and probability function, Rayleigh distribution and its properties, threshold crossing problems, prediction of extreme values; statistical prediction of random vibration, application to civil and mechanical engineering. Prerequisite: ApSc 115 or equivalent. (Fall)

*263 **Atmospheric Physics for Engineers I** (3)
Atmospheric radiation: phenomenological equation of transfer; solutions to the transfer equation; optical, physical, and chemical properties of atmospheric constituents; remote sensing and the direct inversion problem; energy transfer and atmospheric structure. Prerequisite: approval of Department. (As arranged)

*264 **Atmospheric Physics for Engineers II** (3)
Atmospheric dynamics: mean structure of the atmosphere, temperature, pressure, and wind fields; mass, momentum, and energy transfer; large-scale features of atmospheric circulation; regional features of atmospheric circulation; micrometerology. Prerequisite: approval of Department. (As arranged)

*Offered at NASA–Langley Research Center but may be offered on campus when arranged.

270 Theoretical Acoustics I (3)
Basic acoustic theory in stationary and uniformly moving media; waves in infinite space; sound transmission through interfaces between layered media and between media in relative motion; sound radiation from simple solid boundaries, source and dipole fields; propagation inducts and enclosures. elements of classical absorption of sound. Prerequisite: ME 221, ApSc 213, or equivalent. (As arranged)

271 Random Process Theory I (3)
Random processes; stationarity and ergodicity; mean-square calculus; auto- and cross-correlations and spectra; random processes in linear systems; mean-square estimation, prediction, and filtering; zero and level crossings and peak distributions; applications in aerospace sciences. Prerequisite EngS 203 or approval of Department. (As arranged)

272 Random Process Theory II (3)
Discrete and continuous state Markov processes; chains, queues, diffusion, and passage problems; linear and nonlinear estimation and stochastic control; estimation of correlations and power spectra; applications in engineering problems; scattering from random surfaces; stochastic linearization and stability. Prerequisite: EngS 259 or 260 or 271. (As arranged)

***273 Time Series Analysis** (3)
Harmonic analysis of deterministic and random signals; auto- and cross-correlations and spectra; coherence; modern techniques for spectral estimation including periodogram, Blackman–Tukey, direct filtering, maximum entropy, and maximum likelihood; fast Fourier transform and zoom FFT; effects of finite length and digitization on bias and variability; spectral analysis with randomly sampled data; digital filtering; applications in modern technology. Prerequisite: EngS 271 or approval of Department. (As arranged)

274 Environmental Noise Control (3)
Introduction to the physical effects of noise and vibration on man, practical sources of noise and their control; building noise, ventilation system noise, mechanical equipment noise, aircraft noise, automobile and truck noise; factors affecting vibration levels and vibration control by structural design, damping, and isolation. Prerequisite: EngS 270, ME 215. (As arranged)

***275 Theoretical Acoustics II** (3)
General theory of sound propagation in homogeneous media, viscous and heat conduction effects; methods of solving the inhomogeneous wave equation; theory of sound radiation, sources, dipoles, quadrupoles; radiation from moving sources; scattering and diffraction of sound by obstacles; introduction to acoustics of inhomogeneous media, geometric acoustics. Prerequisite: EngS 270. (As arranged)

***276 Acoustical and Mechanical Measurements** (3)
Characteristics of signals, basic transducer elements, standards of measurements and calibrations, signal recording and processing, acoustical and vibration instrumentation, vibration exciters, vibration testing techniques, flow mechanical measurements. Prerequisite: EngS 270, ME 215. (As arranged)

***277 Physical Acoustics** (3)
Concepts of continuum mechanics and thermodynamics, wave propagation in real media, thermal viscous and relaxational attenuations, piezoelectric crystals and ultrasonics, wave propagation in rigid and deformable porous media. Prerequisite: EngS 275. (As arranged)

***278 Psychological and Physiological Acoustics** (3)
Auditory system and its response to sound, experimental methodology in psychoacoustics, subjective response to sound, environmental noise and its

*Offered at NASA–Langley Research Center but may be offered on campus when arranged.

evaluation, criteria for the prediction of noise nuisance, nonauditory system response to noise. Prerequisite: approval of Department. (As arranged)

*279 **Human Factors in Engineering** (3)
Man–machine interface, effects of physical stress on human behavior and performance, life support system, learning and conditioning of physical stress. (As arranged)

*280 **Special Topics in Acoustics** (3)
Current methods and problems in acoustics. Topics chosen from such areas as aerospace noise generation and control; instruments and procedures for acoustics measurements; and responses of structures, people, and communities to noise. Prerequisite: approval of Department. (As arranged)

*281 **Advanced Programming Techniques for Engineering Mechanics Problems** (3)
Techniques for efficient construction of large computer programs for engineering systems with emphasis on fundamental structured programming principles. Application to engineering mechanics systems such as finite elements and structural optimization. Effects of CPU organization and other hardware features of computer systems at NASA–Langley on numerical computations involved in engineering systems. Organization and management of databases for large engineering mechanics systems. Prerequisite: approval of Department. (As arranged)

282 **Computer-Aided Design** (3)
Fundamental concepts in the development of computational algorithms for the design of structures, machine component and assemblies, and other engineering systems. Representation of the design process and design specifications as a network of decision tables and logical flags. Optimization techniques and algorithms in design applications. Interactive computer-aided design methods based on the use of remote-access computer terminals. General-purpose computer programs for engineering analysis and design. Students, individually or in groups, develop a small-scale general-purpose design program in an appropriate area, such as structural design, machine design, urban planning, environmental quality control, etc. Prerequisite: EE 51 or equivalent, CE 210 or equivalent, and approval of Department. (Fall)

283 **Application of Computer Graphics in Engineering** (3)
Curve-fitting techniques as applied to computer graphics; construction of a library of geometric lines and curves connecting a series of discrete points. Representation of two- and three-dimensional geometrical shapes by a set of discrete points. Automatic generation and display on CRT screen of geometrical shapes consisting of a grid of discrete points interconnected by user-selected geometric shapes. Automatic mesh generation, transformations, projections, and the concept of "hidden" lines. Use of remote computer terminals and graphic plotter equipment in interactive computer-graphics applications. Prerequisite: EE 51 or equivalent; or concurrent registration: EngS 284. (Spring)

284 **Numerical Methods in Engineering** (3)
Uses of computers in engineering and science; numerical interpolation, integration, and differentiation; least squares approximations and application to data fitting; roots of polynomials; eigenvalue and eigenvector problems; solution of systems of linear equations; ordinary differential equations; introduction to solution of partial differential equations; applications to initial and two-point boundary value problems in engineering mechanics and other areas of engineering. Prerequisite: approval of Department. (Fall)

*Offered at NASA–Langley Research Center but may be offered on campus when arranged.

285 **Finite Element Methods in Engineering Mechanics** (3)
Calculus of variations. Variational formulation of the finite element method. Techniques of constructing and assembling characteristic element matrices. Rayleigh–Ritz method. Galerkin method. Application to problems in structural mechanics, fluid mechanics, heat flow, and solid mechanics. Computer implementation of the finite element method. Convergence characteristics. Prerequisite: approval of Department. (Spring)

*286 **Analysis and Design of Thin-Walled Structures** (3)
Statics of thin-walled beams and panels, force interplay between stiffeners and skin in the analysis and design of stiffened thin-walled structures; strength and stiffness of locally buckled stiffened structures; classification of loads and safety factors; different considerations governing the design of thin-walled structures; critical evaluation of various structural design procedures. Prerequisite: approval of Department. (As arranged)

*287 **Automated Design of Complex Structures** (3)
Review of techniques for automated design including mathematical programming, fully stressed design, and optimality criteria; application of automated design techniques to stiffened and composite shell-type structures; multiple-load conditions and design constraints. Prerequisite: approval of Department. (As arranged)

288 **Advanced Finite Element Methods in Structural Mechanics** (3)
Review of variational formulation of the finite element method. Formulation of various continuum and structural elements. Application to static and dynamic problems in elasticity, plasticity, large deflection, and instability in plates and shells. Recent developments in finite element methods. Prerequisite: CE 210, EngS 285. (As arranged)

289 **Special Topics in Theoretical and Applied Mechanics** (3)
Prerequisite: approval of Department. (As arranged)

298 **Research** (arr.)
Basic research projects as arranged. May be repeated for credit. (Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

*310 **Aeroacoustics** (3)
General theory of aerodynamic sound generation and propagation, Lighthill's formulation of jet noise, similarity laws, supersonic and subsonic jet noise, boundary-layer noise, fan and compressor noise, helicopter noise, sonic booms. Current problems in aeroacoustics. Prerequisite: EngS 275. (As arranged)

*311 **Nonlinear Acoustics** (3)
Finite amplitude waves and waves in moving stratified media. Interaction between linear and nonlinear waves, wave propagation through nonlinear media, applications to transmission of sound through ducts with flow and absorbing walls. Prerequisite: approval of Department. (As arranged)

*312 **Theory of Random Vibration** (3)
Response of linear systems to stationary random inputs. Failures resulting from dynamic response. Response of space vehicle structures to intense noise fields, measurement, and application. Prerequisite: EngS 271, ME 215. (As arranged)

*313 **Structural Acoustic Interaction** (3)
Coupled response of structures to sound, system of infinite extent, system of finite extent, sound radiation from structure, sound transmission through structure. Panel response to turbulent boundary-layer excitation. Sound radiation from mechanically excited structure vibration. Prerequisite: EngS 270, 312. (As arranged)

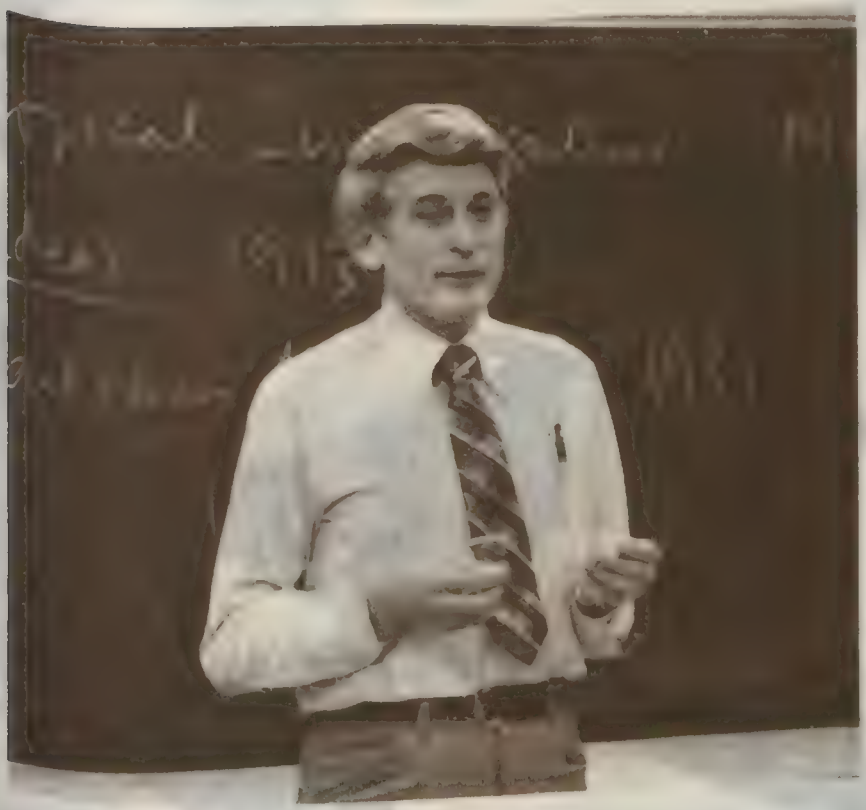
*Offered at NASA–Langley Research Center but may be offered on campus when arranged.

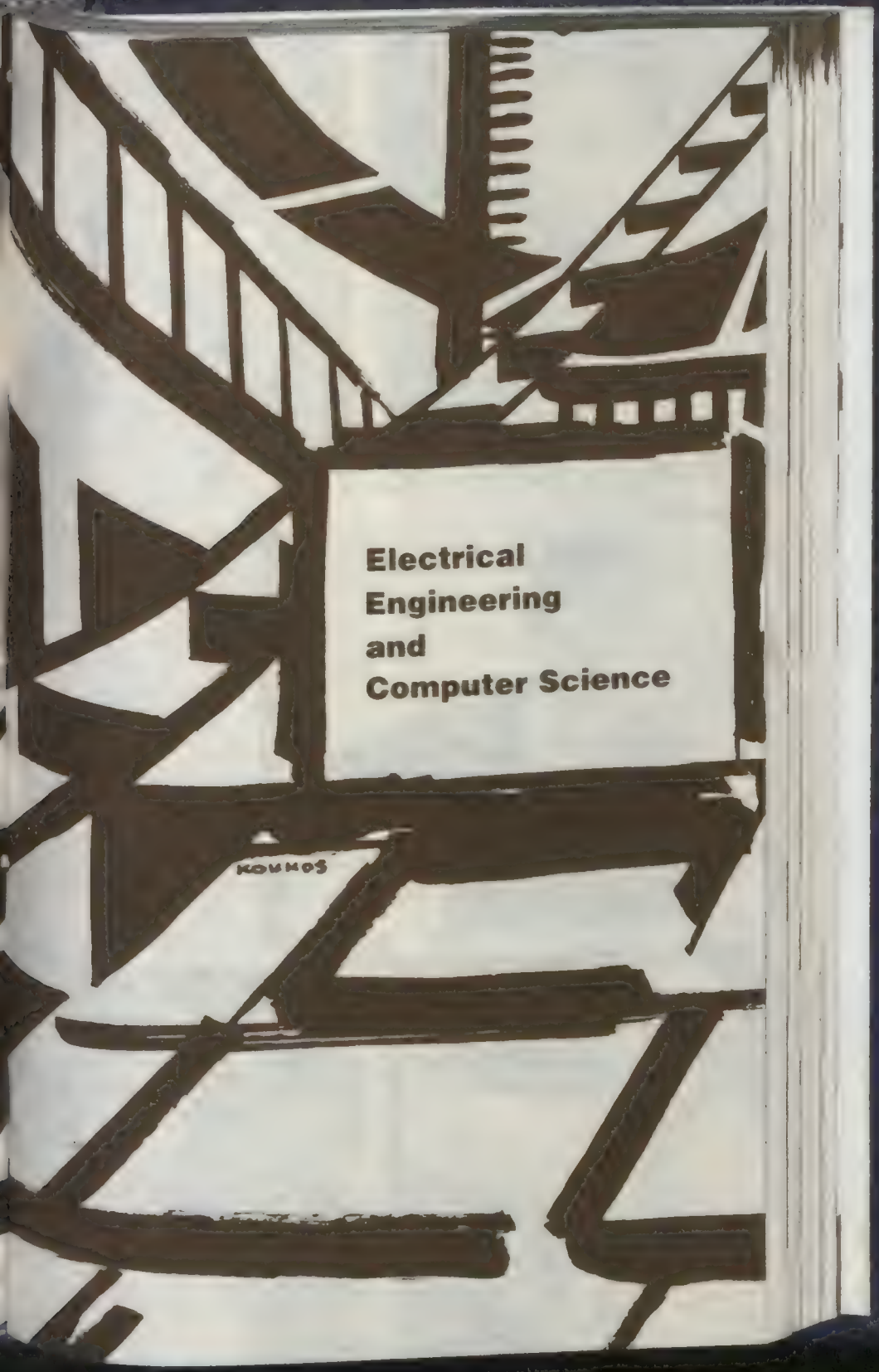
314 **Advanced Numerical Methods in Engineering** (3)
Advanced methods for numerical solution to engineering problems: finite difference solutions to elliptic, parabolic, and hyperbolic equations, method of characteristics, implicit and explicit initial value methods and their stability, optimization and mathematical programming methods, numerical solutions to integral equations, selected topics for fourth-generation computers. Prerequisite: EngS 284, ApSc 213. (As arranged)

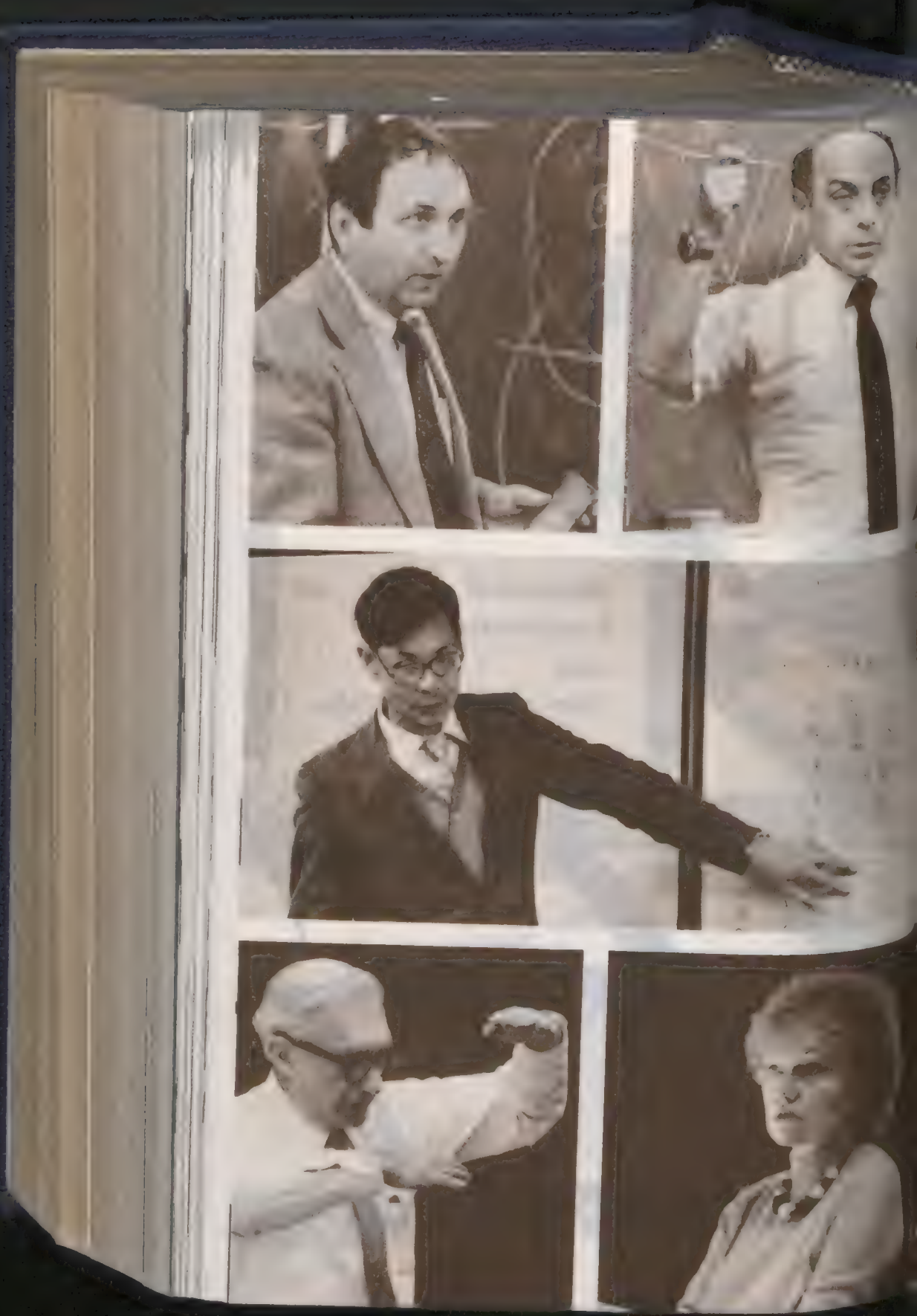
315 **Introduction to Nonlinear Mechanics of Continua** (3)
Polar decomposition, invariance, isotropy, representation theorems for invariants and isotropic tensor functions; deformation, kinematics, stress, balance principles; principles for constitutive relations; applications to nonlinear elasticity and non-Newtonian fluids. Prerequisite: ApSc 212. (Spring, even years)

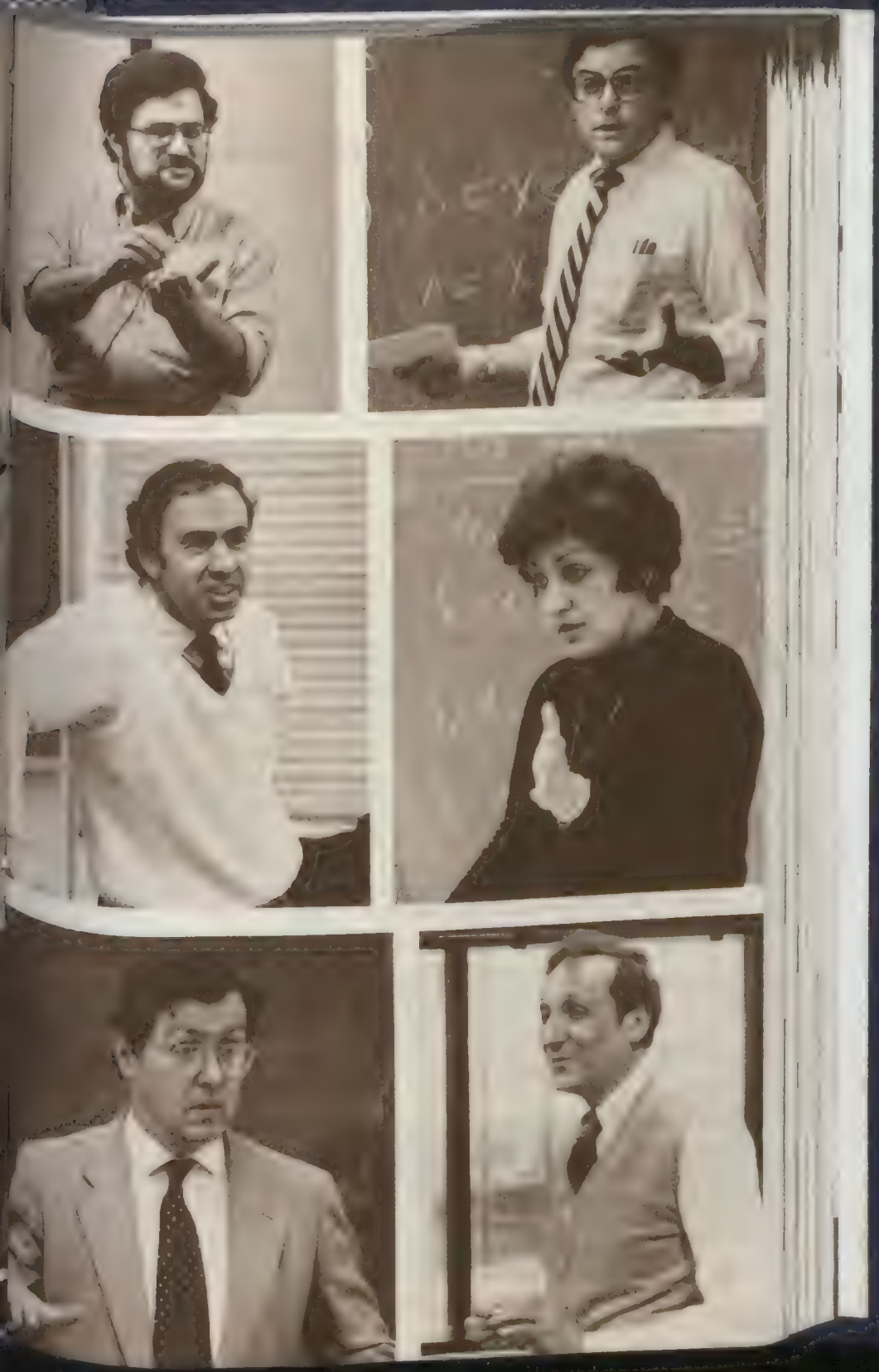
398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)




Electrical
Engineering
and
Computer Science
KOUNOS





Electrical Engineering and Computer Science

Professors R.B. Heller, W.K. Kahn, R.L. Pickholtz, M.F. Eisenberg, A.C. Meltzer, W.D. Maurer, A.D. Friedman, H.J. Helgert, R.H. Lang (*Chairman*), J.D. Foley, T.N. Lee, E. Della Torre, R.J. Allen (*Research*)

Professorial Lecturers D.L. Hogan, J.M. Aein, J.T. Coleman, H.-L.A. Hung, M.J. Marcus, W. Wasyklyiwskyj, A.A. Wolf, L. Scharff, W.D. Jackson, W.T. Bisignani, S. Karp, P.J. Crepeau, S.H. Durrani, W.J. Eisner, R.K. Khatri, C.E. Dunham, L.M. Leibowitz, R.J. Leopold, R.B. Edwards, P.M. Kelly, J.S. Lee, M. Mohajerbi, F. Dellon, O.E. Marvel, J.S. Vandergraft, J.R. Silverman, J.A. Knight, F.P. Pantuso, J.H. Scharen-Guivel, S.-S. Chen, D.B. Newman, Jr., A.V. Dundzila, J. Foreman, M.H. Friedman, T.T. Nieh, J.G. Adler, C. Alexander, Jr., D.C. Roberts, G.J. Kowalski, W.J. Atkins, Jr.

Associate Professors E.H. Braun, N. Kyriakopoulos, L.J. Hoffman, R.L. Carroll, Jr., S.Y. Berkovich, M.B. Feldman, R.J. Harrington, M.H. Loew, D.C. Rohlfs (*Director of Laboratories*), J.L. Sibert (*Research*), P.S. Bock, M.E. Zaghloul

Adjunct Associate Professor B. Jabbari

Associate Professorial Lecturers J.W. Benoit, A. Schneider, J.L. Torres, F.J. Ricci, E.C. Foudriat, A.S. Gill, W.W. Wu, C.-H.C. Wang, H. Carus, M.C. Chen, A.F. Manfredi, Jr., R.D. Angelari, J.C.-C. Hsing, G.R. Lawrence, J.W. Fussel, R.A. Herring, Jr., A.K. Mehrotra, R.H. Evans, P.A. Lamb, C.H. Bergman, W.J. Francis, H.N. Ho, C.G. Omidyar, L.H. Raesly, C.V. Stewart, B.D. Crane, R.R. Landberg, D.L. Schweitzer, M.S. Gluck, Y. Chang, S.H. Kaisler, D.R. Smith, A.L. Breitler, P.K. Wahi, H.I. Bassen, C.A. Eldridge, S.B. Kuznetsov, R.F. Rada, J.A. Lipkin

Assistant Professors C.A. Denbaum, S. Rotenstreich

Assistant Professorial Lecturers E.S. Armstrong, T.M. Bottegal, F.M. Brosi, Jr., R. Shankar, T.R. Husson, E.H. Neal, R.L. Cunningham, D.E. Eckhardt, Jr., E.B. Leiderman, R. Rassai, K.J. Schmucker, J.L. Rogers, J.J. Seppy, J.S. Tripp, J.S. Davies, Jr., L.A. Fletcher, C.E. McCullough, G.R. Shuman, J.B. Bronder, C.E. Knadler, Jr., S.J. Koch, J.D. Kotulski, S.A. Shamma, R.M. Tarakan, E.A. Walker, A.R. Mahmoodshahi, D.A.J. Eide, O.O. Storaasli, T. Nelson, M.C. Frame, R.M. Holland, P.P. Senyo

Lecturer E. Abramic

Instructor C.D. Martin

The undergraduate programs of study in the Department of Electrical Engineering and Computer Science lead to the following degrees: Bachelor of Science in Electrical Engineering; Bachelor of Science in Electrical Engineering, Computer Engineering option; Bachelor of Science in Electrical Engineering, Premedical Engineering option; and Bachelor of Science in Computer Science.

Electrical Engineering Undergraduate Study

Electrical engineering as an engineering discipline is concerned with mastering a knowledge of electricity. Electrical engineers design and run generators that provide electrical energy for homes and factories and design and run transmission networks that carry and motors that utilize this power to drive machinery. Harnessing electromagnetic radiation, electrical engineers pro-

duce radio waves for the propagation of radio and television signals and the transmission of information via satellites. Electrical engineers design and develop the electronic circuits used in communications equipment and computers. These machines have enhanced our logical and computational capabilities to permit mankind to solve some of its most complicated problems. Microminiaturization of electronic components has fostered the development of hand-held calculators and portable communication equipment. Electrical engineers are now developing instrumentation to assist the medical profession in understanding the causes of disease and to aid in enhancing the quality of and prolonging life. The production of electricity from nuclear power and control of nuclear power plants is of growing concern to electrical engineers. The world's primary energy sources are limited, and electrical power has become an even more important resource. Electrical engineers are involved in the research to produce electrical energy directly from solar power.

Electrical engineering is a discipline in which practical, theoretical, and scientific aspects are integrated into a well-balanced discipline. Basic sciences such as physics and mathematics form the roots on which electrical engineering builds to create an applied science and to develop problem-solving techniques. Analysis, synthesis, and design go hand in hand. The electrical engineering curriculum provides the student with such an integrated approach. The first two years of the curriculum are essentially common to all undergraduate fields in the School and allow students to develop a sound foundation of basic sciences coupled with engineering sciences. The third year continues with engineering and or computer sciences and begins an in-depth study of electrical engineering. The fourth year is devoted totally to electrical engineering. At the beginning of the fourth year the student has a choice of either following the regular electrical engineering curriculum or branching off into an area of concentration in computer or premedical engineering.

The Department of Electrical Engineering and Computer Science has modern laboratory equipment, including its own computers. The student has an opportunity during the last year to work on individual projects in which ingenuity, coupled with faculty advice and guidance, allows concentration in areas such as computers, communications, microwaves, controls, electronics, medical engineering, and circuits.

Course schedules have been arranged to accommodate the full-time, part-time, and co-op students. Undergraduate courses are offered once a year during the day for full-time students and once every two years in the evening for part-time students.

Subject Areas

Communications

EE 143: Elements of Communication Engineering Design I
EE 144: Elements of Communication Engineering Design II
EE 146: Communications Design Laboratory

Computer Engineering

CSci 51: Applications of Computers
CSci 52: Computers and Societal Problems
CSci 147: Assembly Language Programming of Microcomputers
CSci 150: Introduction to Microcomputers

CSci 151: Systems Software and Software Engineering
CSci 153: Design of Switching Systems
CSci 154: Digital Computer Design
CSci 155: Introduction to Numerical Methods for Computers
CSci 156: Introduction to Operating Systems
CSci 157: Assembly Language Programming of Large System Computers
CSci 158: Algorithmic Methods
CSci 159: Programming and Data Structures
CSci 163: Senior Computer Science Project Laboratory I
CSci 164: Senior Computer Science Project Laboratory II
CSci 166–67: Computer Science Laboratory I and II

Controls, Systems, and Power

EE 166: Electrical Power Laboratory I
EE 172: Control Systems Design
EE 176: Control Systems Laboratory
EE 177: Electrical Energy Conversion
EE 178: Electrical Power Systems

Electronics

EE 20: Introductory Engineering Electronics
EE 121: Engineering Electronics and Design
EE 122: Digital Electronics and Design
EE 124: Electronic Devices
EE 126: Introduction to VLSI Design and Simulation
EE 127: VLSI Fabrication Techniques
EE 128: Testing and Simulation of VLSI Circuits
EE 169: Advanced Electronics Design Laboratory

Fields and Waves

EE 31: Fields and Waves I
EE 32: Fields and Waves II
EE 133: Electromagnetic Waves and Microwave Systems Design
EE 168: Microwave and Laser Engineering Laboratory

Laboratories and Measurement

CSci 163: Senior Computer Science Project Laboratory I
CSci 164: Senior Computer Science Project Laboratory II
EE 63: Instrumentation and Networks Laboratory
EE 65: Introductory Electronics Laboratory
EE 66: Digital Electronics Design Laboratory
EE 67: Switching Circuits Laboratory
EE 163: Senior Electrical Engineering Project Laboratory I
EE 164: Senior Electrical Engineering Project Laboratory II

Medical Engineering

EE 184: Medical Engineering Instrumentation and Systems Design
EE 186: Medical Engineering Laboratory

Networks

EE 11: Linear Networks I
EE 12: Linear Networks II
EE 113: Network Analysis and Design
EE 116: Introduction to Network Synthesis

Core Curriculum

Normally the first four semesters are common to all Electrical Engineering undergraduate degree programs and to undergraduate fields in other departments within the School of Engineering and Applied Science.

First Semester

BiSc 11: Introductory Biology for Science Majors (4) (Pre-Med only)
CSci 51: Applications of Computers (3)
Math 31: Single-Variable Calculus I (3)
Phys 13: General Physics for Engineering and Applied Science (3)
Engl 9 or 10: English Composition: Language as Communication (3)
Elective: Selected from humanities or social sciences (3) (Except Pre-Med)

Second Semester

BiSc 12: Introductory Biology for Science Majors (4) (Pre-Med only)
Chem 13: General Chemistry (4)
CSci 52: Computers and Societal Problems (3)
Math 32: Single-Variable Calculus II (3)
Phys 14: Mechanics and Thermal Physics (3)
Elective: Selected from humanities or social sciences (3) (Except Pre-Med)

Third Semester

ApSc 57: Analytical Mechanics I (2)
ApSc 113: Engineering Analysis I (3)
ApSc 115: Engineering Analysis III (3)
Math 33: Multivariable Calculus (3)
Phys 15: Electricity and Magnetism (3)
Elective: Selected from humanities or social sciences (3)

Fourth Semester

Chem 22: Introductory Quantitative Analysis (5) (Pre-Med only)
ApSc 58: Analytical Mechanics II (3)
ApSc 114: Engineering Analysis II (3)
CE 140: Materials Science (3)
EE 11: Linear Networks I (3)
Phys 16: Modern Physics (3)
Elective: Selected from humanities or social sciences (3) (Except Pre-Med)

Electrical Engineering Curriculum

Fifth Semester

EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 63: Instrumentation and Networks Laboratory (1)
EE 65: Introductory Electronics Laboratory (1)

CSci 147: Assembly Language Programming of Microcomputers (3)
Elective: Selected from humanities or social sciences (3)

Sixth Semester

CSci 153: Design of Switching Systems (3)
EE 32: Fields and Waves II (3)
EE 66: Digital Electronics Design Laboratory (1)
EE 67: Switching Circuits Laboratory (1)
EE 122: Digital Electronics and Design (3)
EE 177: Electrical Energy Conversion (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

EE 121: Engineering Electronics and Design (3)
EE 143: Elements of Communication Engineering Design I (3)
EE 163: Senior Electrical Engineering Project Laboratory I (1)
Elective: Technical electives (9) (three courses selected from ApSc 199; EE 113, 126, 127, 133, 178; CSci 150, 155; ME 131, 187)
Elective: Select one laboratory (1 credit) from EE 146, 166, 169

Eighth Semester

EE 144: Elements of Communication Engineering Design II (3)
EE 164: Senior Electrical Engineering Project Laboratory II (1)
EE 172: Control Systems Design (3)
Elective: Technical electives (5) (two courses selected from ApSc 199; EE 116, 124, 128, 160, 165, 184; ME 194)
Elective: Select one laboratory (1 credit) from EE 166, 168, 176, 186

Technical Electives

ApSc 199: Honors Research Project and Seminar (3)
CSci 150: Introduction to Microcomputers (3)
CSci 155: Introduction to Numerical Methods for Computers (3)
EE 113: Network Analysis and Design (3)
EE 116: Introduction to Network Synthesis (3)
EE 124: Electronic Devices (3)
EE 126: Introduction to VLSI Design and Simulation
EE 127: VLSI Fabrication Techniques
EE 128: Testing and Simulation of VLSI Circuits
EE 133: Electromagnetic Waves and Microwave Systems Design (3)
EE 146: Communications Design Laboratory (1)
EE 160: Electrical Measurements and Instrumentation (3)
EE 165: Senior Design Project (2)
EE 166: Electrical Power Laboratory I (1)
EE 168: Microwave and Laser Engineering Laboratory (1)
EE 169: Advanced Electronics Design Laboratory (1)
EE 178: Electrical Power Systems (3)
EE 184: Medical Engineering Instrumentation and Systems Design (3)
EE 186: Medical Engineering Laboratory (1)
ME 131: Thermodynamics (3)
ME 187: Heat Transfer (3)
ME 194: Energy Conversion (3)

Computer Engineering Option

Computer engineering is a developing discipline that combines electronic design, programming of computers, and mathematics into a comprehensive area. The student learns the design and utilization of computers for scientific and business applications. Students who complete this option will be able to design both hardware and software needed for minicomputer and large-scale computing systems. The student will also be competent in hardware and software utilization of computers for control of large systems. The curriculum prepares the student for a career in computer design, applications, and utilization or to continue study in graduate school.

Prerequisite: first four semesters as described in the Core Curriculum.

Fifth Semester

CSci 147: Assembly Language Programming of Microcomputers (3)
CSci 158: Algorithmic Methods (3)
EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 63: Instrumentation and Networks Laboratory (1)
EE 65: Introductory Electronics Laboratory (1)

Sixth Semester

CSci 153: Design of Switching Systems (3)
CSci 159: Programming and Data Structures (3)
EE 32: Fields and Waves II (3)
EE 66: Digital Electronics Design Laboratory (1)
EE 67: Switching Circuits Laboratory (1)
EE 122: Digital Electronics and Design (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

CSci 150: Introduction to Microcomputers (3)
CSci 155: Introduction to Numerical Methods for Computers (3)
CSci 163: Senior Computer Science Project Laboratory (1)
CSci 166: Computer Science Laboratory I (1)
Elective: Technical elective (3) (selected from EE 113, 121, 126, 127, 133, 143)
Elective: Selected from humanities or social sciences (3)

Eighth Semester

CSci 154: Digital Computer Design (3)
CSci 156: Introduction to Operating Systems (3)
CSci 164: Senior Computer Science Project Laboratory (1)
CSci 167: Computer Science Laboratory II (1) or EE 176: Control Systems Laboratory (1)
EE 172: Control Systems Design (3)
Elective: Technical elective (3) (selected from EE 124, 128, 144, 165, 177, 184)

Technical Electives

ApSc 199: Honors Research Project and Seminar (3)
EE 113: Network Analysis and Design (3)

EE 121: Engineering Electronics and Design (3)
EE 124: Electronic Devices (3)
EE 126: Introduction to VLSI Design and Simulation
EE 127: VLSI Fabrication Techniques
EE 128: Testing and Simulation of VLSI Circuits
EE 133: Electromagnetic Waves and Microwave Systems Design (3)
EE 143: Elements of Communication Engineering Design I (3)
EE 144: Elements of Communication Engineering Design II (3)
EE 165: Senior Design Project (2)
EE 177: Electrical Energy Conversion (3)
EE 184: Medical Engineering Instrumentation and Systems Design (3)

Premedical Engineering Option

The premedical engineering option will permit the student who completes the work to obtain a bachelor's degree in engineering and have sufficient preparation to apply to a medical school for work toward a doctor of medicine degree. The student will also have sufficient background to work in various allied health fields, in the research and development of new electronic equipment used in medicine, or to continue as a graduate student in engineering with exceptional qualifications for medical engineering.

Prerequisite: first four semesters as described in the Core Curriculum.

Fifth Semester

Chem 151: Organic Chemistry (3)
Chem 153: Organic Chemistry Laboratory (1)
EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 63: Instrumentation and Networks Laboratory (1)
EE 65: Introductory Electronics Laboratory (1)
CSci 147: Assembly Language Programming of Microcomputers (3)

Sixth Semester

Chem 152: Organic Chemistry (3)
Chem 154: Organic Chemistry Laboratory (1)
CSci 153: Design of Switching Systems (3)
EE 32: Fields and Waves II (3)
EE 66: Digital Electronics Design Laboratory (1)
EE 67: Switching Circuits Laboratory (1)
EE 122: Digital Electronics and Design (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

EE 121: Engineering Electronics and Design (3)
EE 143: Elements of Communication Engineering Design I (3)
EE 163: Senior Electrical Engineering Project Laboratory I (1)
EE 169: Advanced Electronics Design Laboratory (1)
Elective: Selected from humanities or social sciences (6)
Elective: Technical elective (3)

Eighth Semester

EE 164: Senior Electrical Engineering Project Laboratory II (1)
EE 172: Control Systems Design (3)
EE 184: Medical Engineering and Systems Design (3)
EE 186: Medical Engineering Laboratory (1)
Elective: Selected from humanities or social sciences (6)
Elective: Technical elective (3)

Technical Electives

ApSc 199: Honors Research Project and Seminar (3)
Bioc 221–22: General Biochemistry (3–4)
BiSc 145: Principles of Development (4)
BiSc 148: Histology (4)
EE 144: Elements of Communication Engineering Design II (3)

Electrical Engineering Undergraduate Courses

The faculty member whose name appears at the end of each course description is the director for that course. The course director is not necessarily the instructor for any given semester.

3 **Electronics for Non-Engineers I** (3)
Introduction of the basic theory and practical applications of modern electronics, with emphasis on material of value to the nontechnical individual in an increasingly technological society. Topics include basic electrical theory, solid-state devices, amplifiers and other electronic circuits, instrumentation, communications, and microcomputer circuits. May not be taken for credit by students in SEAS. (Fall) (Eisenberg)

11 **Linear Networks I** (3)
Signals and waveforms, average value and RMS, network concepts, elements, and parameters. Kirchhoff's laws, simple networks, energy and power, differential equations of networks and their solution, phasors and steady-state analysis, measurements, impedance concepts, resonance, and filtering. Prerequisite: Phys 15, ApSc 113. (Spring—day and evening; Fall—evening) (Zaghloul)

12 **Linear Networks II** (3)
Singular functions; Laplace transform; network functions, poles and zeros; total response; time and frequency domains; convolution theorems; Fourier analysis, spectra; frequency response, Bode plots; two-port parameters. Prerequisite: ApSc 114, EE 11. (Fall—day and evening; Spring—evening) (Zaghloul)

20 **Introductory Engineering Electronics** (3)
Various types of devices used in electronic engineering considered from the point of view of the physics of their operation and from the engineering point of view of their application to electronic circuits. Solid-state, vacuum, and gaseous devices. Primary emphasis on application of these elements in power supplies and in linear amplifiers. Introduction of design concepts through use of graphical techniques. Prerequisite: EE 11. (Fall—day and evening; Spring—evening) (Heller)

31 **Fields and Waves I** (3)
Vector calculus, orthogonal coordinates, Coulomb and Gauss laws, scalar potential, dipoles, method of images, dielectrics, capacitance, steady cur-

rents, Laplace and Poisson equations, boundary-value problems. Prerequisite: Phys 15, 16; ApSc 113. (Fall—day; Fall, even years—evening) (Kahn)

32 **Fields and Waves II** (3)
Biot–Savart law, Ampere law, vector potential, magnets, Faraday law, Maxwell equations, plane waves, and Poynting vector. Prerequisite: ApSc 114; EE 31. (Spring—day; Spring, odd years—evening) (Kahn)

63 **Instrumentation and Networks Laboratory** (1)
Use of standard laboratory electronic instruments in the measurement of electrical and electronic components and networks. Verification of network laws and theorems. Characteristics and limitations of instruments. Application of instruments to measure voltage, current, resistance, impedance, power, time, period, and frequency. Use of digital multimeter, frequency counter, function generator, and oscilloscope to measure steady-state and transient phenomena. Prerequisite or concurrent registration: EE 12, 20. (Fall—day and evening; Spring—evening) (Rohlfs)

65 **Solid-State Devices Laboratory** (1)
Testing and measurement of the characteristics of solid-state devices used in electronic systems: diodes, BJTs, FETs, SCRs, timers, op amps, and ICs. applications. Design and measurement of the characteristics of power supplies, BJT and FET amplifier circuits, clipping and clamping circuits, power control circuits, and timing circuits. Prerequisite or concurrent registration EE 12, 20, 63. (Fall—day and evening; Spring—evening) (Rohlfs)

66 **Digital Electronics Design Laboratory** (1) (Same as CSci 66)
Characteristics of electronic devices used in switching, sweeping, and waveforming circuits. Generation of waveforms. Digital storage devices and sequential circuits. Characteristics of different methods to produce binary logic gates. Characteristics of integrated circuits. Prerequisite: EE 65. prerequisite or concurrent registration: EE 122. (Spring—day and evening; Fall—evening) (Rohlfs)

67 **Switching Circuits Laboratory** (1) (Same as CSci 67)
Analysis and design of combination and sequential switching circuits using integrated circuits. Design of decoders, adders, counters, shift registers, character generators, and arithmetic circuits. Prerequisite or concurrent registration: EE 66, 153. (Spring—day and evening; Fall—evening) (Rohlfs)

113 **Network Analysis and Design** (3)
Applications of matrix theory and linear graphs to electrical network analysis; network equations; signal-flow graphs; introduction to state-space techniques; solution of state-space equations on a digital computer. Network transfer functions, properties of active networks including reciprocity, stability, activity, and feedback. Use of network analysis programs such as ECAP. Prerequisite: EE 12, 20. (Fall—day; Fall, even years—evening) (Lee)

116 **Introduction to Network Synthesis** (3)
Network functions and their properties. Positive real functions and testing for this property. Two-element, one-port network synthesis; RLC one-port synthesis; the approximation problem in the frequency domain; modern filter theory and design; two-port ladder and lattice synthesis. Introduction to digital filters; truncation errors; realization techniques. Prerequisite: EE 113. (Spring—day; Spring, odd years—evening) (Lee)

121 **Engineering Electronics and Design** (3)
Graphical analysis and design beyond the level covered in EE 20. Design of push pull, direct-coupled, and class B and C amplifiers. Design of operational amplifiers; use in filters and electronic systems. Design of oscillators, active filters, modulators, and demodulators. Design of power supplies. Prerequisite: EE 12, 20. (Fall—day and evening) (Heller)

122 **Digital Electronics and Design** (3)
Introduction to and design of large signal circuits used in computers and communications systems. Design of logic gates and flipflops. Concepts in integrated circuit design. Design of counting and timing circuits using ICs. Pulse, sweep, and waveshaping circuits. Prerequisite: EE 12, 20. (Spring—day and evening) (Eisenberg)

124 **Electronic Devices** (3)
Principles of operation of electronic devices used in electrical networks, communication systems, and electronic circuits. Properties of electronic devices and their applications. Modeling of devices such as diodes, transistors, and lasers. Fabrication methods of discrete components and integrated circuits. Prerequisite: EE 12, 32, 121; Phys 16. (Spring—day; Spring, odd years—evening) (Heller)

126 **Introduction to VLSI Design and Simulation** (3)
An introduction to the theory of and use of a CAD/CAM system for the design of VLSI circuits. Topics include stick diagramming, NMOS transistors, switch and gate logic, PLAs, finite state machines, master-slice techniques, design rules for the CAD system, speed and power considerations, floor planning, layout techniques. The student will design a VLSI circuit using the CAD/CAM computer and simulate the design. May be taken for graduate credit. Prerequisite: CSci 147, 153, EE 67 and 122 or equivalent. (As arranged) (Zaghloul)

127 **VLSI Fabrication Techniques** (3)
Choice of circuit technologies, process technologies associated with various types of components, different chip architectures, master slice techniques, gate arrays, standard cell, PLA. Introduction to the fabrication of VLSI, MOS technology, and oxidation technology. Introduction to the testing of VLSI technology. May be taken for graduate credit. Prerequisite: CSci 147, 153, and EE 122. (As arranged) (Zaghloul)

128 **Testing and Simulation of VLSI Circuits**
A continuation of EE 126 principally for the testing of VLSI circuits that have been designed and fabricated. Topics include testing techniques and use of the VLSI system testing laboratory. Simulation techniques used in the design of VLSI circuits. Static tests, dynamic testing, functional testing. Students must test the circuits previously designed. May be taken for graduate credit. Prerequisite: EE 126 and 127. (As arranged) (Zaghloul)

133 **Electromagnetic Waves and Microwave Systems Design** (3)
Time-harmonic Maxwell equations, complex Poynting vector, transmission lines, characteristics of common waveguides, resonant cavities. Smith chart, design of coaxial and waveguide systems, Lorentz reciprocity, simple antennas, design of linear antenna arrays. Prerequisite: EE 32. (Fall—day; Fall, even years—evening) (Kahn)

143 **Elements of Communications Engineering Design I** (3)
Signal analysis; Fourier transforms, power spectrum; principles of modulation, amplitude, frequency, and pulse modulation. Comparison of analog and digital transmission. Time and frequency division multiplexing. Random signals and noise. Transmission systems for cable, radio, satellite, and optical links. Prerequisite: EE 121 (or concurrent registration); ApSc 114 or permission of course director. (Fall—day and evening) (Helgert)

144 **Elements of Communications Engineering Design II** (3)
Statistical theory of communications. Comparison of communications systems in noisy channels. Data communications, design of modems. Concept of information theory. Coding for noisy channels. ARQ and forward error control. Communications protocols. Elements of traffic theory. Special topics

and student project. Prerequisite: EE 143 or permission of course director. May be taken for graduate credit by graduate students who are not majoring in communications. (Spring—day and evening) (Helgert)

146 **Communications Design Laboratory** (1)
Experiments in support of the analysis and design of communication systems. Characteristics of: real-time communication signals; spectrum analyzer verification of waveforms; analysis and design of encoding and decoding amplitude modulation (AM) and frequency modulation (FM) circuits, frequency conversion, frequency and time division multiplexing, and digital communication circuits—continuously variable slope delta modulation (Delta) and pulse code modulation (PCM). Prerequisite or concurrent registration: EE 12, 32, 63, 65, 121, 143, 153. (Fall—day and evening) (Helgert)

160 **Electrical Measurements and Instrumentation** (3)
Electrical measurement from direct current through high radio frequencies. Measurements of current, voltage, power, resistance, capacitance, inductance, energy, phase angle, frequency, and time. Measurements of high-frequency signals including field strength, signal-to-noise ratio, impedance, and attenuation. Analog-to-digital conversion techniques and digital instrumentation for the control of measurement and instrumentation systems. Transducer characteristics and analog signal processing instrumentation. Laboratory demonstrations of measurements and instrumentation techniques. Prerequisite: EE 12, 32, 121; CSci 150. (Spring—evening) (Heller)

163 **Senior Electrical Engineering Project Laboratory I** (1)
Conception and design of a one-year project to be completed in EE 164. Performance of a market survey and economic analysis of the product. Completion of the preliminary design. Prerequisite: EE 67; prerequisite or concurrent registration: EE 121, 143, and senior status. (Fall—day and evening) (Meltzer)

164 **Senior Electrical Engineering Project Laboratory II** (1)
Completion and construction of the project started in EE 163. Oral and written presentation of the product designed. Prerequisite: EE 163. (Spring—day and evening) (Meltzer)

165 **Senior Design Project** (2)
Conception, design, construction, and testing of an original project in hardware or software. Complete report to include, if applicable, schematic diagrams and repair procedures. Prerequisite: senior status. (Spring—day) (Pickholtz)

166 **Electrical Power Laboratory I** (1)
Experiments in support of the analysis and design of electrical power systems. Measurements of the characteristics of devices to generate electricity. Rectification and inversion processes for power systems and drives. Prerequisite or concurrent registration: EE 20, 65, 177. (Fall and Spring—day and evening) (Harrington)

168 **Microwave and Laser Engineering Laboratory** (1)
Experiments in support of analysis and design of transmission lines, microwave components, microwave systems, fiber-optic systems, antennas and antenna arrays. Introduction to the characteristics of laser and optical systems. Prerequisite: EE 32, 67, 133, 143. (Fall—day and evening) (Kahn)

169 **Advanced Electronics Design Laboratory** (1)
Experiments in support of the theory of the analog operation of electronic devices. Characteristics of nonlinear operation of electronic devices. Use of electronic devices in communication equipment. May be taken for graduate credit by graduate students who are not majoring in energy conversion, power, and transmission. Prerequisite: EE 32, 67; prerequisite or concurrent registration: EE 121, 143. (Fall—day and evening) (Heller)

172 **Control Systems Design** (3)
Mathematical models of linear systems; steady-state and transient analyses; root locus and frequency response methods; synthesis of linear feedback control systems. Prerequisite: ApSc 114; EE 12 or ME 134. (Spring—day and evening) (Carroll)

176 **Control Systems Laboratory** (1)
Experiments in support of control theory, involving the use of the digital computer for process control in real time. Design of feedback and compensation with computer implementation. Digital simulation of linear and nonlinear systems. Prerequisite or concurrent registration: EE 172 or equivalent. (Spring—day and evening) (Carroll)

177 **Electrical Energy Conversion** (3)
Fundamentals of electromechanical energy conversion. Electromechanical transducers and their equivalent circuits, three-phase and single-phase AC rotating machines, DC machines, rotating machines as circuit elements. Prerequisite: EE 12, 31. (Fall and Spring—day; Spring, even years—evening) (Harrington)

178 **Electrical Power Systems** (3)
Introduction to electrical power systems; transmission and distribution of electrical power, three-phase circuits, symmetrical components, fault analysis. Voltage, current and power restrictions and limitations. Analysis of lightning and switching surges in power systems. Protective devices—switchgear, arresters, and isolators. May be taken for graduate credit. Prerequisite: EE 177, senior status. (Fall—evening) (Harrington)

184 **Medical Engineering Instrumentation and Systems Design** (3)
Introduction to the applications of engineering design in the medical sciences: terminology of the medical profession; physiology of the human body, from overall systems or functional approach; survey of present-day medical measurements and consideration of those areas in which engineering design may be applied advantageously to medicine. May be taken for graduate credit except by medical engineering majors. (Spring—evening) (Eisenberg)

186 **Medical Engineering Laboratory** (1)
Experiments in support of instrumentation used in medicine and biology; safety considerations. Acquisition and measurement of physiological signals, EKG, EEG, evoked potentials. Processing of signals derived from physiological measurements. Concepts in telemetry of medical signals. Prerequisite or concurrent registration: EE 12, 32, 66, 121, 184. (Spring—day and evening) (Loew)

198 **Research** (1 to 3)
Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and Spring)

Computer Science Undergraduate Study

The Department of Electrical Engineering and Computer Science offers a program of study leading to the degree of Bachelor of Science with a major field in computer science.

Computer science is the study of the computer—its present or potential physical attributes, or hardware, and the methods of its use, or software. The undergraduate curriculum combines systems design, computer programming, and mathematics into a comprehensive area. The student who completes the program will be able to design the hardware and software needed for both large systems and small microprocessor-based computing systems. The curric-

ulum prepares the student for graduate school, for careers in computer or software design, or for applications of computers. The program gives the student the broad background in the fundamentals of computer science necessary to conceive and perceive future improvements in this area.

Widespread use of the digital computer has caused great changes in virtually every area of human endeavor involving data generation, collection, analysis, reduction, and display. Business, economic, legal, educational, scientific, military, political, and humanitarian organizations all have benefited in some way by using computers. Careers are available in every area related to computer science, including designing, testing, operating, installing, programming, maintaining, instructing, and buying and selling computers and related equipment. Faculty members in the department have research interests that include time-sharing systems, information systems, associative memories and processors, simulation, artificial intelligence, robotics, programming languages, automata theory, interactive computer graphics, human factors of the man–machine interface, microprocessors, distributed processing and networking, fault-tolerant design, security and privacy, correctness of programs, analysis of algorithms, database systems, cartography, and spectral analysis.

Well-qualified undergraduate students may participate in faculty research through the Honors Research Program. Students admitted to that program are assigned to selected computer science faculty for academic advising and guidance. They are afforded the opportunity to participate in specially designed research projects and in related seminars.

In addition, a limited number of undergraduate students may participate in research by becoming research assistants. Summer employment as an assistant to a faculty member conducting research may be available.

Computer Science Subject Area

CSci 10: Word Processing, Filing, and Spread Sheet Systems
CSci 11: Microcomputer DBMS, Charting, and Ledger Systems
CSci 30: Introduction to Computing
CSci 40: Computer Programming
CSci 51: Applications of Computers
CSci 52: Computers and Societal Problems
CSci 100: Introduction to Computer Science
CSci 147: Assembly Language Programming of Microcomputers
CSci 150: Introduction to Microcomputers
CSci 151: System Software and Software Engineering
CSci 153: Design of Switching Systems
CSci 154: Digital Computer Design
CSci 155: Introduction to Numerical Methods for Computers
CSci 156: Introduction to Operating Systems
CSci 157: Assembly Language Programming of Large System Computers
CSci 158: Algorithmic Methods
CSci 159: Programming and Data Structures
CSci 161: Discrete Structures for Computing
CSci 171: Computational Methods for Simulation
CSci 177: Programming for Management Systems
CSci 178: Introduction to Database Management
CSci 185: Introduction to Computer Graphics
CSci 188: Distributed Computer Systems

Computer Science Laboratories

CSci 66: Digital Electronics Design Laboratory
CSci 67: Switching Circuits Laboratory

CSci 163: Senior Computer Science Project Laboratory I
CSci 164: Senior Computer Science Project Laboratory II
CSci 166: Computer Science Laboratory I
CSci 167: Computer Science Laboratory II

Computer Science Curriculum

First Semester

Math 31: Single-Variable Calculus I (3)
Phys 13: General Physics for Engineering and Applied Science (3)
Engl 9 or 10: English Composition: Language as Communication (3)
CSci 51: Applications of Computers (3)
Elective: Selected from humanities or social sciences (3)

Second Semester

Math 32: Single-Variable Calculus II (3)
Chem 13: General Chemistry (4)
Phys 14: Mechanics and Thermal Physics (3)
CSci 52: Computers and Societal Problems (3)
Elective: Selected from humanities or social sciences (3)

Third Semester

ApSc 113: Engineering Analysis I (3)
Math 33: Multivariable Calculus (3)
Phys 15: Electricity and Magnetism (3)
CSci 147: Assembly Language Programming of Microcomputers (3)
Elective: Selected from humanities or social sciences (3)

Fourth Semester

ApSc 114: Engineering Analysis II (3)
ApSc 115: Engineering Analysis III (3)
EE 11: Linear Networks I (3)
Phys 16: Modern Physics (3)
CSci 158: Algorithmic Methods (3)
CSci 161: Discrete Structures for Computing (3)

Fifth Semester

EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 63: Instrumentation and Networks Laboratory (1)
EE 65: Introductory Electronics Laboratory (1)
CSci 153: Design of Switching Systems (3)
CSci 159: Programming and Data Structures (3)
CSci 177: Programming for Management Systems (3)

Sixth Semester

EE 122: Digital Electronics and Design (3)
CSci 66: Digital Electronics Design Laboratory (1)
CSci 67: Switching Circuits Laboratory (1)

CSci 150: Introduction to Microcomputers (3)
CSci 155: Introduction to Numerical Methods for Computers (3)
Electives: Selected from humanities or social sciences (6)

Seventh Semester

CSci 151: System Software and Software Engineering (3)
CSci 154: Digital Computer Design (3)
CSci 163: Senior Computer Science Project Laboratory I (1)
CSci 166: Computer Science Laboratory I (1)
Electives: Technical electives (9)

Eighth Semester

CSci 156: Introduction to Operating Systems (3)
CSci 164: Senior Computer Science Project Laboratory II (1)
CSci 167: Computer Science Laboratory II (1)
Elective: Selected from humanities or social sciences (3)
Electives: Technical electives (9)

Technical Electives

Technical electives may be selected from the following courses. Only two courses marked with an asterisk may be taken.

ApSc 57: Analytical Mechanics I (2)
ApSc 58: Analytical Mechanics II (3)
ApSc 116: Engineering Analysis IV (3)
ApSc 199: Honors Research Project and Seminar (3)
*CSci 157: Assembly Language Programming of Large System Computers (3)
*CSci 171: Computational Methods for Simulation (3)
*CSci 178: Introduction to Database Management (3)
*CSci 185: Introduction to Computer Graphics (3)
*CSci 188: Distributed Computing Systems (3)
EE 31: Fields and Waves I (3)
EE 32: Fields and Waves II (3)
EE 113: Network Analysis and Design (3)
EE 121: Engineering Electronics and Design (3)
EE 124: Electronic Devices (3)
EE 126: Introduction to VLSI Design and Simulation
EE 127: VLSI Fabrication Techniques
EE 128: Testing and Simulation of VLSI Circuits
EE 143: Elements of Communication Engineering Design I (3)
EE 144: Elements of Communication Engineering Design II (3)
EE 172: Control Systems Design (3)
EE 177: Electrical Energy Conversion (3)
EE 184: Medical Engineering Instrumentation and Systems Design (3)
EAd 150: Introduction to Engineering Administration (3)
EAd 160: Introduction to Engineering Economic Analysis (3)
EAd 170: Basic Quantitative Methods for Engineering Administration (3)
OR 101: Survey of Operations Research: Deterministic Models (3)
OR 102: Survey of Operations Research: Stochastic Models (3)
OR 151: Linear Programming (3)
Mgt 107: Fundamentals of Behavioral Science (3)
Mgt 120: Information Systems Development I (3)
Mgt 121: Information Systems Development II (3)
Math 101: Introduction to Mathematical Logic (3)
Math 113: Graph Theory (3)
Math 121–22: Introduction to Abstract Algebra (3–3)

Math 123: Linear Algebra (3)
Math 124: Introduction to Matrix Theory (3)
ME 131: Thermodynamics (3)
ME 187: Heat Transfer (3)
ME 194: Energy Conversion (3)
CE 140: Materials Science (3)
CE 190: Contracts and Specifications (2)

Computer Science Undergraduate Courses

The faculty member whose name appears at the end of each course description is the course director. He or she is not necessarily the instructor for any given semester.

10 **Word Processing, Filing, and Spread Sheet Systems** (3)
Introduction to the use of a modern microcomputer system. Word-processing systems, such as APPLE WRITER or WORD STAR. Filing systems, such as DB MASTER or PFS. Spread sheet systems, such as VISICALC or SUPERCALC. Construction of word processing, database, and spread sheet files of medium size and processing on microcomputers. May not be counted toward degree requirements for EE/CSci majors. (Fall and Spring) (Maurer)

11 **Microcomputer DBMS, Charting, and Ledger Systems** (3)
Microcomputer DBMS systems such as dBASE II. Charting systems such as VISIPLOT. Ledger systems such as Peachtree General Ledger. Hands-on experience in using these systems on microcomputers. May not be counted toward degree requirements for EE/CSci majors. Prerequisite: CS 10. (Spring and Fall) (Maurer)

30 **Introduction to Computing** (3)
For students whose majors are not electrical engineering or computer science. Survey of computers and languages; communicating with a computer; introduction to BASIC; obtaining output from a computer; history of computing; positions in the computing industry; the effect of computers on our lives; uses for computers. May not be counted toward degree requirements for EE/CSci majors. Prerequisite: Algebra. (Fall and Spring) (Martin)

40 **Computer Programming** (3)
Introduction to the solution of problems on a digital computer, using a structured FORTRAN language. Data processing concepts, using interactive time-shared terminal computer systems. Writing, debugging, and running programs on various digital computer systems. May not be taken for credit by students in SEAS. Prerequisite: Algebra. (Fall and Spring) (Martin)

51 **Applications of Computers** (3)
Introduction to the solutions of problems on a digital computer, using a structured FORTRAN language. Introduction to structured programming concepts and proper documentation of computer programs. Introduction to matrix algebra with numerical solutions, using the computer. Data processing concepts, using interactive terminals. Writing, debugging, and running programs on various digital computer systems. Prerequisite or concurrent registration: Math 31, or permission of instructor. Graduate students seeking a first course in computing should enroll in CSci 100. (Fall and Spring) (Martin)

52 **Computers and Societal Problems** (3)
Application of the digital computer to the analysis and synthesis of physical, social, cultural, economic, and environmental processes and systems. Software methods for simulation, graphic display, data reduction, and file generation and access in a time-shared environment using BASIC. Comput-

er-related societal problems and processes. Group projects emphasizing research and investigation applied to student-selected interests. Prerequisites: CSci 30, 40, 51, or 100, or equivalent; 2 years of college-preparatory mathematics. (Fall and Spring) (Martin)

66 **Digital Electronics Design Laboratory** (1) (Same as EE 66)
Characteristics of electronic devices used in switching, sweeping, and waveforming circuits. Generation of waveforms. Digital storage devices and sequential circuits. Characteristics of different methods to produce binary logic gates. Characteristics of integrated circuits. Prerequisite: EE 65; prerequisite or concurrent registration: EE 122. (Spring—day and evening; Fall—evening) (Rohlfs)

67 **Switching Circuits Laboratory** (1) (Same as EE 67)
Analysis and design of combinational and sequential switching circuits using integrated circuits. Design of decoders, adders, counters, shift registers, character generators, and arithmetic circuits. Prerequisite or concurrent registration: EE 66, 153. (Spring—day and evening; Fall—evening) (Rohlfs)

100 **Introduction to Computer Science** (3)
More intensive introductory course for students with a science, mathematics, or other quantitative background. Solution of problems on a digital computer using FORTRAN; data processing concepts, numerical and nonnumerical methods using batch or interactive time-shared terminal computer systems. Writing, debugging, and running programs on various digital computer systems. Recommended for graduate and advanced undergraduate students in other departments. Prerequisite: Math 32 or equivalent.
(Fall and Spring—evening) (Martin)

147 **Assembly Language Programming of Microcomputers** (3)
Programming of microcomputers in machine and assembly language. Number systems and codes; architectures of various microcomputers. Methods of addressing and machine control. Data representation in a microcomputer Input—output control. Timing and benchmarking techniques. Prerequisite: CSci 51 or equivalent. May be taken for graduate credit except by majors in computer science. (Fall and Spring) (Maurer)

150 **Introduction to Microcomputers** (3)
Introduction to the structure of microprocessors and microcomputers. Representation of information in the computer. Logic and storage devices. Processor structure, registers, transfer of information, and control. Programming in microcomputers. I/O structure and auxiliary electronics. Interrupt structures, direct memory access. LSI and its implication for microcomputers. Arithmetic operations. Different microcomputer architectures. Prerequisite CSci 147, 153, or permission of course director. (Fall and Spring—day and evening) (Friedman)

151 **System Software and Software Engineering** (3)
(Formerly Introduction to Systems Programming I)
Concepts and use of macro-assemblers, loading and relocation of modules, library management, linkers and loaders. Control of I/O via access methods. Concepts in software engineering such as requirements definition, modularity, structured design, data specifications, functional specifications, verification, documentation, software maintenance. Program design using program design languages, HIPO charts. Software tools. Software project organization, design teams, quality assurance approaches. Prerequisite: CSci 147 or 157 and 159. (Fall—day and evening) (Feldman)

153 **Design of Switching Systems** (3)
Introduction to switching logic and combinational circuits. Analysis of switching devices. Minimization techniques. Number systems and codes, encoders and decoders, logic and electronic design of functional digital units. Use of LSI in logic design. Introduction to sequential circuits. Minimization of sequential machines. Design of synchronous, asynchronous, and pulse

sequential circuits. State assignment and covers. May be taken for graduate credit except by majors in computer science. (Fall and Spring—day and evening) (Friedman)

154 **Digital Computer Design** (3)
Logic and electronic design of functional digital units. Design of: digital computer subsystems, flow of information and logical flow diagrams in timing and control signals; binary and decimal, serial and parallel digital arithmetic units; memory subsystems, channels, I/O, and storage subsystems; the control unit of a digital computer. Introduction to microprogramming. Design of a small digital computer. May be taken for graduate credit, except by majors in computer science. Prerequisite: CSci 153, 147 or 157. (Fall and Spring—day and evening) (Meltzer)

155 **Introduction to Numerical Methods for Computers** (3)
Use of numerical methods in engineering and scientific problems. Concepts of algorithm and flowchart, errors in computer and numerical methods. Introduction to numerical methods for the solution of simultaneous linear algebraic equations, roots of equations, determination of eigenvalues and eigenvectors, numerical differentiation and integration, interpolation and solution of ordinary and partial differential equations. Statistical methods for the evaluation of experimental data and correlation techniques, curve fitting. Prerequisite: ApSc 114, 115; a course in high-level computing. (Fall—day and evening) (Meltzer)

156 **Introduction to Operating Systems** (3)
(Formerly Introduction to Systems Programming II)
Introduction to operating systems, evaluation of operating systems O.S. services. Process management, process state, concurrent processing, synchronization, events. O.S. structure, the kernel approach, processor scheduling, task switching, monitors. System management, memory management, process loading, resource allocation, queue management, communication with peripherals. File systems. Interactive computation. Protection systems. Performance evaluation. Prerequisite: CSci 147 or 157 and 159. (Spring—day and evening) (Hoffman)

157 **Assembly Language Programming of Large System Computers** (3)
Programming of large system computers in machine and assembly language. Number systems and codes. Architectures of various mainframe computers. Data representation in a large computer. Methods of addressing and machine control. Input-output control. Timing and benchmarking techniques. Prerequisite: CSci 51 or equivalent. May be taken for graduate credit except by majors in computer science. (Fall and Spring) (Maurer)

158 **Algorithmic Methods** (3)
Structure and application of high-level programming languages. Structured programming and nonnumeric algorithmic development. Introduction to recursion, parsing, grammars, compiling, and BNF. Team programming techniques, program development languages, and documentation. PASCAL is utilized. Designed for majors in computer science. May be taken for graduate credit except by majors in computer science. Prerequisite: CSci 51 and concurrent registration in CSci 147 or 157. (Fall and Spring—day and evening) (Denbaum)

159 **Programming and Data Structures** (3)
Discrete structures and data structures in computing. Use of tree structures, arrays, lists, stacks, files, strings, and linked structures. Sorting, searching, hashing, and merging of data files. List and string processing languages. Prerequisite: CSci 201 or 147 or 157; and 158. May be taken for graduate credit, except by majors in computer science. (Spring—day and evening) (Feldman)

161 Discrete Structures for Computing (3)
Introduction to discrete mathematical structures that form the basis for computing. Sets, graphs, functions, mappings, lattice, groups and semigroups, combinational problems, and enumeration. Finite-state machines, representation, identification, transitions, and reduction. Directed graphs, trees, and paths. Regular expressions and Turing machines. May be taken for graduate credit except by majors in computer science. Prerequisite or concurrent registration: CSci 158, Math 33. (Fall—day and evening) (Maurer)

163 Senior Computer Science Project Laboratory I (1)
Conception and design of a one-year project in hardware and/or software to be completed in CSci 164. Performance of a market survey and economic analysis of the product. Completion of the preliminary design. Prerequisite: EE 122; CSci 66, 67, 150, 159; senior status. (Fall—day and evening) (Della Torre)

164 Senior Computer Science Project Laboratory II (1)
Completion and construction of the project started in CSci 163. Oral and written presentation of the product designed. Prerequisite: CSci 163. (Spring—day and evening) (Della Torre)

166 Computer Science Laboratory I (1)
Experiments in support of the theory and design of microprocessor and microcomputer hardware and software. Use of microprocessors in control of systems. Use of simulators, cross-compilers, and development systems. Prerequisite or concurrent registration: EE 122; CSci 67, 150, 153, 147 or 157. (Fall—day and evening) (Meltzer)

167 Computer Science Laboratory II (1)
Experiments in support of the design of digital computing systems. Design of memory, control, and arithmetic units. Input and output in a computer. Software experiments to support the operating system for a small computer. Prerequisite or concurrent registration: CSci 154, 156, 166. (Spring—day and evening) (Meltzer)

171 Computational Methods for Simulation (3)
Computational methods for continuous and discrete system simulation using both digital and analog computers. Effects of computer software and hardware architectures on computational precision and accuracy requirements. Random number generation and testing. Calibration and scaling technique. Verification and validation technique. Class project: applications to games for small microcomputers. Graphics interfacing. Analysis of case studies. Prerequisite: ApSc 113, 115; CSci 155, 159. (Spring–day and evening) (Bock)

177 Programming for Management Systems (3)
Intermediate programming course with application in business and government commercial programming. Emphasis on programming for accounting and management information systems. Use of file editing, report generation, and tapes. COBOL is utilized. Prerequisite: CSci 158. (Fall—day and evening) (Bock)

178 Introduction to Database Management (3)
Concepts in database systems; inverted file structure; query formulation and language; data structure to minimize access time; construction of a database management system; survey of some existing database management systems. Prerequisite: CSci 158, 159. (Spring—day and evening) (Berkovich)

185 Introduction to Computer Graphics (3)
Architecture of interactive display devices and connectivity to a computer. Implementation of graphics concepts of two-dimensional and three-dimensional viewing, clipping, and transformations. Raster graphics concepts. Hidden-line algorithms. Shading and texture techniques. Prerequisite: CSci 159. (Spring) (Sibert)

188 **Distributed Computing Systems** (3)
Connection of microprocessors and minicomputers into a distributed computing system. Use of shared memory and distributed databases. Synchronization problems and concurrency in distributed systems. Shared bus structure, both loop and token passing. Geographically distributed systems and computer network. Local area networks and point-to-point interconnections. Examples of systems. Prerequisites: CSci 154, 159, 151. (Spring) (Meltzer)

198 **Research** (1 to 3)
Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and Spring)

Graduate Study

The Department of Electrical Engineering and Computer Science provides the student who possesses a degree of maturity and basic knowledge one of the most stimulating experiences for advanced study. The department offers study leading to the Master of Science, Professional, and Doctor of Science degrees. The student may study in the following areas of concentration: systems science, networks, and controls; electrophysics (electronics, fields, and waves); communications; medical engineering; computer science (software and systems); computer science (artificial intelligence and simulation); energy conversion, power, and transmission; or telecommunications and computers.

The graduate programs are formulated to take into consideration the student's individual strengths, skills, aspirations, and abilities and are determined through consultation with the faculty adviser. The program should provide the student with thorough understanding of the area of concentration and with the breadth of knowledge necessary in modern engineering and computer science. Each graduate student is assigned a faculty adviser on the basis of study interests, helping to develop a close student–faculty relationship during the course of the program.

Colloquium Requirement: Graduate students are required to attend several department colloquia each semester. These are intended to broaden the student's professional outlook and to encourage interaction with the faculty. Schedules are posted.

The graduate programs are also designed to provide an educational service to the Washington technical community. Many courses have been developed after consultation with private industry and government agencies in the area. A substantial number are offered during both the afternoon and the evening and alternate from year to year.

The department has continuously kept the graduate program up to date through contact with recent developments, research generated within the department, and the addition of experts in appropriate fields who serve as part-time and adjunct faculty.

The department periodically publishes a detailed brochure to supplement the present catalogue with information about procedures, requirements, regulations, and scope of its graduate programs. Special pamphlets describing specific programs are also available.

Areas of Concentration

Doctoral students must select a minimum of three courses designated with an asterisk as part of their program in their major area.

Communications

EE 204: Stochastic Signals and Noise
EE 205: Stochastic Processes in Electrical Engineering
EE 208: Digital Image Processing
EE 241: Information Theory
EE 242: Coding Theory
EE 243: Communication Theory I
EE 244: Communication Theory II
EE 245: Signal Detection and Estimation Theory
EE 246: Digital Communications
*EE 247: Communications Systems
EE 248: Computer Communication Networks I
EE 249: Computer Communication Networks II
*EE 250: Telecommunications Security Systems
*EE 251: Switched Telecommunication Networks
EE 252: Digital Signal Processing Techniques
EE 253: Sonar Systems
EE 254: Radar Systems
*EE 257: Secure Communications
*EE 258: Radio Communications Systems I
*EE 259: Radio Communications Systems II
*EE 277: Satellite Communications Systems
EE 298: Research
EE 299–300: Thesis Research
*EE 345: Advanced Detection Theory
*EE 347: Telecommunications Software Engineering
EE 349: Communications Research
EE 399: Dissertation Research

Computer Science (Core Courses)

Required of computer science majors in software and systems, hardware and systems, and artificial intelligence and simulation.

CSci 217: Computing Algorithms
CSci 232: Automata and Formal Languages
CSci 237: Computing Systems I
CSci 258: Advanced Programming Languages

Computer Science (Software and Systems)

CSci 215: Advanced Data Structures
CSci 216: Information Retrieval Systems
CSci 219: Interactive Computer Graphics I
CSci 222: Design of User-Computer Interfaces
CSci 227: Management Information Systems and Database Management
CSci 229: Computer Security Systems
CSci 247: Languages for Systems Programming
CSci 255: Analysis and Correctness of Algorithms
*CSci 256: Design of Translators
*CSci 267: Operating Systems I
*CSci 268: Operating Systems II

CSci 298: Research
CSci 299–300: Thesis Research
*CSci 319: Interactive Computer Graphics II
*CSci 327: Advanced Topics in Information Systems
*CSci 356: Seminar in Programming Language Design and Implementation
*CSci 358: Concurrency and Parallelism in Programming Languages
CSci 391: Computer Science Research
CSci 399: Dissertation Research

Computer Science (Hardware and Systems)

EE 126: Introduction to VLSI Design and Simulation
EE 127: VLSI Fabrication Techniques
EE 128: Testing and Simulation of VLSI Systems
EE 214: VLSI Design
EE 230: Physical Design of Memory Devices
CSci 203: Microprocessors and Microcomputers
CSci 212: Discrete Analysis in Computer Science
CSci 231: Sequential Machines
CSci 238: Computing Systems II
*CSci 239: Comparative Computer System
*CSci 240: Theory and Practice of Microprogramming
*CSci 243: Fault Tolerant Systems and Design Automation
CSci 244: Data Communications
*CSci 245: Advanced Computer Systems Theory I
*CSci 246: Advanced Computer Systems Theory II
CSci 298: Research
CSci 299–300: Thesis Research
*CSci 337: VLSI System Organization and Applications
CSci 391: Computer Science Research
CSci 399: Dissertation Research

Computer Science (Artificial Intelligence and Simulation)

CSci 212: Discrete Analysis in Computer Science
*CSci 220: Pattern Recognition
CSci 221: Simulation and Heuristics
CSci 222: Design of User-Computer Dialogues
*CSci 223: Computational Heuristics
*CSci 224: Artificial Intelligence
*CSci 226: Robotics
CSci 231: Sequential Machines
CSci 281: Numerical Solutions of Algebraic Systems
CSci 282: Numerical Solutions of Field Problems
CSci 298: Research
CSci 299–300: Thesis Research
*CSci 324: Knowledge Based Systems
*EE 371: Simulation Methods for Systems Analysis
CSci 391: Computer Science Research
CSci 399: Dissertation Research

Electrophysics (Electronics, Fields, and Waves)

EE 201: Natural Modes and Transients in Electrical Systems
EE 206: Electromagnetic Theory and Applications I
EE 207: Electromagnetic Theory and Applications II
EE 221: Physical Electronics I

EE 222: Physical Electronics II
EE 223: Optical Communications Systems
*EE 224: Electronics of Lasers
EE 225: Nonlinear Electronics
*EE 226: Fiber and Integrated Optics
EE 227: Industrial Electronics
EE 228: High-Frequency Electronics
EE 231: Field Analysis and Potential Theory
*EE 232: Electrodynamics
EE 233: Microwaves and Components
*EE 234: Electromagnetic Wave Propagation
EE 235: Antennas
*EE 236: Plasma Dynamics
*EE 237: Waves in Random Media
EE 238: Remote Sensing
EE 239: Numerical Laboratory in Electromagnetics
EE 255: Optical Processing
EE 298: Research
EE 299–300: Thesis Research
*EE 321: Approximate Mathematical Techniques for Electromagnetics
*EE 322: Advanced Waveguide Diffraction and Design
*EE 323: Principles of Microelectronics
*EE 329: Electrophysics Research
EE 399: Dissertation Research

Energy Conversion, Power, and Transmission

EE 178: Electrical Power Systems
EE 202: Linear Systems Theory I
EE 206: Electromagnetic Theory and Applications I
*EE 261: Electromechanical Energy Conversion
*EE 262: Power Electronics
EE 263: Design of Reliable Emergency and Standby Power Systems
*EE 264: Direct Electrical Energy Conversion
EE 265: Transients in Electrical Power Transmission Lines
EE 266: Electrical Power Transmission I
EE 267: Electrical Power Transmission II
EE 268: Electrical Power Distribution
EE 269: Issues in Electrical Power Generation and Transmission
EE 298: Research
EE 364: Applications of Direct Energy Conversion
EE 368: High-Voltage Testing Techniques for Electrical Apparatus
EE 399: Dissertation Research

Medical Engineering

EE 280: Introduction to Medicine for Engineers I: Physiology and Anatomy
EE 281: Introduction to Medicine for Engineers II: Physiology and Anatomy
EE 282: Medical Measurements I
EE 283: Medical Measurements II
EE 285: Sensory-Evoked Potentials I
EE 287: Rehabilitation Engineering
*EE 289: Clinical Engineering
EE 298: Research
EE 299–300: Thesis Research
*EE 381: Computer-Aided Analysis of Physiological Signals
*EE 382: Physiological Controls and Systems
*EE 384: Medical Imaging
*EE 385: Sensory-Evoked Potentials II

*EE 386: Bioelectromagnetics
EE 389: Medical Engineering Research
EE 399: Dissertation Research

Systems Science, Networks, and Controls

EE 202: Linear Systems Theory
EE 203: Graph Theory and Applications
EE 204: Stochastic Signals and Noise
EE 212: Network Analysis
*EE 213: Computer-Aided Analysis and Design of Systems
EE 214: VLSI Design
EE 215: Linear Network Synthesis I
*EE 216: Synthesis of Active and Distributed Networks
*EE 217: Advanced Network Theory
EE 219: Digital Filter: Design and Realization
EE 262: Power Electronics
*EE 271: Linear Multivariable Control Theory
EE 272: Computer Control Systems
EE 273: Systems Optimization
*EE 274: Nonlinear Systems
*EE 275: System Identification and Adaptive Control Systems
*EE 279: Stochastic Control Systems
EE 298: Research
EE 299–300: Thesis Research
EE 319: Systems Science, Networks, and Control Research
*EE 372: Analysis and Control of Large Systems
EE 399: Dissertation Research
*CSci 220: Pattern Recognition

Telecommunications and Computers

EE 144: Elements of Communication Engineering Design II
EE 204: Stochastic Signals and Noise
EE 205: Stochastic Processes in Electrical Engineering
EE 242: Coding Theory
EE 243: Communication Theory I
EE 244: Communication Theory II
EE 246: Digital Communications
EE 248: Computer Communication Networks I
EE 249: Computer Communication Networks II
EE 250: Telecommunications Security Systems
EE 251: Switched Telecommunication Networks
EE 257: Secure Communications
EE 347: Telecommunications Software Engineering
CSci 159: Programming and Data Structures
CSci 201: Introduction to Computer Systems
CSci 216: Information Retrieval Systems
CSci 227: Management Information Systems and Database Management
CSci 229: Computer Security Systems
CSci 244: Data Communications
CSci 247: Language for Systems Programming
CSci 267: Operating Systems I
CSci 268: Operating Systems II
EAd 211–12: Engineering Administration
EAd 261: Economic Analysis in Engineering Planning
EAd 262: Finance for Engineers

EAd 269: Elements of Decision Making and Problem Solving
EAd 281: Systems Analysis and Management I
EAd 292: Structural Analysis of Management Problems
OR 251: Linear Programming

Master of Science Degree Program

The Department of Electrical Engineering and Computer Science offers graduate study leading to the degree of Master of Science in the following areas of concentration. There are no required courses or programs of study in any of the concentration areas except for the core courses required in the computer science concentrations (see page 148). Each student formulates an individualized program in consultation with an assigned faculty adviser. Faculty members who may serve as advisers are listed after each area.

Communications—Braun, Helgert, Heller, Lang, Pickholtz

Computer Science (Software and Systems)—Berkovich, Bock, Della Torre, Denbaum, Feldman, Foley, Hoffman, Martin, Maurer, Rotenstreich, Sibert

Computer Science (Hardware and Systems)—Berkovich, Della Torre, Foley, Friedman, Meltzer, Zaghloul

Computer Science (Artificial Intelligence and Simulation)—Bock, Carroll, Della Torre, Foley, Loew, Meltzer, Rotenstreich, Sibert, Zaghloul

Electrophysics (Electronics, Fields, and Waves)—Allen, Braun, Heller, Kahn, Lang

Energy Conversion, Power, and Transmission—Harrington, Kahn, Lang, Meltzer

Medical Engineering—Eisenberg, Loew

Systems Science, Networks, and Controls—Carroll, Kyriakopoulos, Lee, Loew, Meltzer, Zaghloul

Telecommunications and Computers—Helgert, Hoffman, Meltzer, Pickholtz; Shane, Steiner (Engineering Administration)

Admission

In addition to the general requirements, the applicants must have satisfied the requirements for admission to graduate study (see pages 31–33). Admission to graduate study toward a master's degree requires an appropriate bachelor's degree (one in engineering technology is normally not sufficient) from a recognized institution and evidence of capacity for productive work in the field selected, as indicated by grades, Graduate Record Aptitude Test scores, and similar data. Students are encouraged to submit Graduate Record Examination scores; candidates who do submit such scores will be given preference in consideration for research and teaching fellowships. The transfer of credit regulations (see page 33) apply as well to courses taken as a nondegree student through the Division of Continuing Education and Summer Sessions at George Washington University.

General Requirements

The applicant must be recommended for admission by the chairman of the Department of Electrical Engineering and Computer Science; must have at least a quality-point index of 2.70 (on a scale with 4.00 maximum), or equivalent, for the last 60 semester hours of undergraduate work; and must be

adequately prepared in the basic sciences (physics; chemistry or biology) and in mathematics (four semesters beyond precalculus).

Specific Requirements

In addition to the general requirements, the applicant must have satisfied through undergraduate studies the following specific requirements according to the area of concentration:

Communications

1. Networks with applications using Laplace transforms (6 semester hours—EE 11, 12; or equivalent)
2. Electronics (3 semester hours—EE 20; or equivalent)
3. Communication theory (3 semester hours—EE 143; or equivalent)

Computer Science

1. Computer programming using BASIC or FORTRAN, assembly language, PASCAL or PL/I and programming theory (9 semester hours—CSci 100, 157, and 158; or equivalent)
2. Computer hardware (6 semester hours—CSci 153 and 154; or equivalent)
3. Discrete mathematics and data structures (6 semester hours—CSci 159 and 161; or equivalent)

Electrophysics

1. Networks with applications using Laplace transforms (6 semester hours—EE 11, 12; or equivalent)
2. Electronics including analysis, design, and physical theory (6 semester hours—EE 20, 121; or equivalent)
3. Fields and waves (6 semester hours—EE 31, 32; or equivalent)

Energy Conversion, Power, and Transmission

1. Network analysis using Laplace transforms (6 semester hours—EE 11, 12; or equivalent)
2. Fields and waves (6 semester hours—EE 31, 32; or equivalent)
3. Electrical energy conversion (3 semester hours—EE 177; or equivalent)

Medical Engineering

Either:

1. Network theory (3 semester hours—EE 11; or equivalent)
2. Electronic circuits (6 semester hours—EE 20, 121; or equivalent)

Or:

1. Computer programming (3 semester hours—CSci 100; or equivalent)
2. Computer hardware and software (6 semester hours—CSci 153, 157; or equivalent)

Systems Science, Networks, and Controls

1. Networks with applications using Laplace transforms (9 semester hours—EE 11, 12, 113; or equivalent)
2. Electronics (3 semester hours—EE 20; or equivalent)
3. Control theory (3 semester hours—EE 172; or equivalent)

Telecommunications and Computers

1. Communication theory (3 semester hours—EE 143; or equivalent)
2. Computer science (6 semester hours—CSci 100, either 150 or 157; or equivalent)

In cases in which some undergraduate deficiencies exist, the student may be required to complete 6 semester hours of undergraduate work. Normally this work must be completed prior to enrolling in graduate courses. If such deficiencies represent more than 6 semester hours, the applicant may be admitted as an unclassified student to complete a specified undergraduate program before being admitted as a degree candidate.

Program of Study

Upon admission to the Master of Science degree program, the graduate student is assigned a faculty adviser. In consultation the student and faculty adviser formulate the program of study and complete the Graduate Program of Studies (Form 1) for submission to the department chairman for approval. This form should be completed prior to or at the student's first registration. During consultation the student should determine whether to request permission to pursue the nonthesis option.

The program of study for the Master of Science degree consists of a minimum of 24 semester hours of graduate-level courses and 6 semester hours of thesis or, for the nonthesis option, a minimum of 33 semester hours of graduate-level courses. In both cases a student must select a minimum of three graduate courses outside his or her major area of concentration unless the student already has a graduate degree in another field.

For the thesis option, a minimum of 12 semester hours must be in the major field of concentration. For the nonthesis option, a minimum of 21 semester hours must be in the major field. In the case of an interdisciplinary program, no courses outside the major are required but an approximately equal division of courses between or among the disciplines is required.

A maximum of three courses at the 100 level may be counted toward the requirements for the degree; the course description must specify that the course may be taken for graduate credit.

Master's Comprehensive Examination

After completing the prescribed program in either the thesis or the nonthesis option, the student must pass the Master's Comprehensive Examination. The examination is scheduled twice a year. On the prescribed form and prior to the deadline, students must notify the department of their intent to take the examination. Thereafter, requests to withdraw must be submitted in writing in advance of the examination date. Unexcused absence constitutes a forfeiture and is regarded as a failure of the examination. The examination lasts an entire day. The student is asked to solve several problems relating to the subject matter of his or her major area of study; the student must demonstrate the ability to apply what has been learned while pursuing a formal graduate program. The examination is not limited to those specific courses that the student has taken but is designed to demonstrate the student's ability to integrate material from several course areas and to learn from the readings.

A student who fails the Master's Comprehensive Examination on the first attempt may, in exceptional circumstances, be reexamined one more time if approval is given by the appropriate examining committee and the department. In the event of failure to pass the examination on the second attempt, the student's degree candidate status terminates.

Professional Degree Program

The Department of Electrical Engineering and Computer Science offers graduate study leading to a professional degree. This program is for students interested in pursuing course work beyond the master's degree with emphasis on applied subject material, rather than on research. Successful completion of the professional degree program leads to the degree of Engineer or Applied Scientist. Students may study for the professional degree in the following concentrations: communications; computer science (hardware and systems), (software and systems), (artificial intelligence and simulation); electrophysics (electronics, fields, and waves); medical engineering; systems science, networks, and controls; energy conversion, power, and transmission. There are no required courses or programs of study in any of the concentrations for the professional degree except for the core courses required in the computer science concentrations (see page 148). Each student formulates an individualized program in consultation with an assigned faculty adviser.

Admission

In addition to the School of Engineering and Applied Science requirements for admission to graduate study toward a professional degree (see pages 35–36), applicants for the professional degree programs in the Department of Electrical Engineering and Computer Science must meet the following general and specific requirements.

General Requirements

The applicant must be recommended for admission by the Chairman of the Department of Electrical Engineering and Computer Science; must have a quality-point index of at least 3.0 (on a scale of 4.0 maximum) and two years of professional experience after obtaining the master's degree; and must be adequately prepared in the basic sciences (physics, and chemistry or biology) and in mathematics (calculus through differential equations).

Specific Requirements

In addition to the general requirements, the applicant must have satisfied through previous studies the following specific requirements according to the area of concentration:

Communications

Nine semester hours of statistical theory of communications and 3 semester hours of information theory—EE 204, 241, 243, 244; or equivalent.

Computer Science (Software and Systems)

Twelve semester hours of computer programming and theory at the graduate level—CSci 215, 217, 232 and 258; or equivalent.

Computer Science (Hardware and Systems)

Twelve semester hours of computer design and theory at the graduate level—CSci 215, 217, 232, and 237; or equivalent.

Computer Science (Artificial Intelligence and Simulation)

Fifteen semester hours of computer science and numerical methods at the graduate level—CSci 215, 217, 221, 232, 281; or equivalent.

Electrophysics

Twelve semester hours of physical electronics and electromagnetics at the graduate level—EE 201, 206, 207, 221; or equivalent.

Energy Conversion, Power, and Transmission

Twelve semester hours of electrical machine theory and networks at the graduate level—EE 261, 262, 264, 266; or equivalent.

Medical Engineering

Twelve semester hours of medical engineering at the graduate level—EE 280, 281, 282, 283; or equivalent.

Systems Science, Networks, and Controls

Twelve semester hours of network system analysis at the graduate level, including a knowledge of state-space and linear graph theory—EE 202, 204, 212, 272, 273; or equivalent.

An applicant who fails to meet the above specific requirements, but meets all other admission requirements, may be admitted with a program of study that is increased beyond the minimum requirements so that sufficient background material may be covered.

Program of Study

Upon admission to the professional degree program, the student is assigned a faculty adviser. Together they formulate a program of study for the student that must contain a minimum of 30 semester hours of courses and complete the Graduate Program of Studies form. Programs of study and any subsequent changes must be approved by both the faculty adviser and the department chairman.

The program of study for the professional degree in the Department of Electrical Engineering and Computer Science will normally consist of a minimum of 18 semester hours of graduate-level courses in the major area of concentration and a minimum of 9 additional semester hours of graduate-level courses outside the major area in support of the student's program. A student who is changing his or her major area from that studied for the master's degree or who lacks the specific requirements needed for admission may be required to take additional courses to make up deficiencies. Such additional work should not normally exceed 12 semester hours.

Doctor of Science Degree Program

The Department of Electrical Engineering and Computer Science offers programs of graduate study leading to the degree of Doctor of Science in the areas of concentration given under *Specific Requirements*. There are no formal required courses or programs of study in the areas listed except for the core courses required in the computer science areas of concentration (see page 148). Upon admission, each student formulates an individualized program in consultation with the assigned faculty adviser. Special fields of each faculty member are listed below.

Allen, R. J.—Research Professor of Engineering and Applied Science
Remote Sensing; Lasers: Lidar

Berkovich, S.—Associate Professor of Engineering and Applied Science
Information Systems; Data Structures; Associative Memories and Processors

Hock, P.—Associate Professor of Engineering
Computer Science; Simulation; Programming Languages; Microprocessor Systems; Artificial Intelligence; Robotics

Braun, E.H.—Associate Professor of Engineering and Applied Science
Antenna Theory; Coding Theory; Physical Electronics

Carroll, R.L.—Associate Professor of Engineering and Applied Science
Control Theory; Adaptive Systems

Della Torre, E.—Professor of Engineering and Applied Science
Numerical Device Modeling; Magnetic Recording and Bubble Memory and VLSI Components; Magnetic Phenomena

Denbaum, C.—Assistant Professor of Engineering and Applied Science
Computer Science; Programming Languages; Programming Methodology

Eisenberg, M.F.—Professor of Engineering and Applied Science
Medical Engineering; Thermography; Evoked Response; Ultrasonics

Feldman, M.B.—Associate Professor of Engineering and Applied Science
Computer Science; Programming Languages; Data Structures; Information Display Systems; Computer Graphics; Automata Theory

Foley, J.D.—Professor of Engineering and Applied Science
Interactive Computer Graphics; Human Factors of the Man–Machine Interface; Distributed Processing and Networking

Friedman, A.D.—Professor of Engineering and Applied Science
Computer Architecture and Organization; Switching Theory and Logic Design; Microprocessors; Diagnosis and Fault Tolerant Design of Digital Circuits; Digital System Design Automation

Harrington, R.J.—Associate Professor of Engineering
Simulation and Control of Electrical Machinery and Power Systems; Transient Stability; Transmission Line Switching Transients; Computer Modeling

Helgert, H.J.—Professor of Engineering and Applied Science
Communication and Information Theory; Coding Theory; Data Communications; Computer Networks

Heller, R.B.—Professor of Engineering and Applied Science
Information Processing; Computer-to-Computer Communications Networks; Satellite Communications; Electromagnetic Radiation

Hoffman, L.J.—Associate Professor of Engineering and Applied Science
Computer Science; Security and Privacy; Criminal Justice Information Systems; Social Implications

Kahn, W.K.—Professor of Engineering and Applied Science
Antennas; Microwave Components; Fiber Optics; Electrophysics

Kyriakopoulos, N.—Associate Professor of Engineering and Applied Science
Computer-Aided Network Design; System Theory; Control Theory; Digital Filtering

Lang, R.H.—Professor of Engineering and Applied Science
Wave Propagation in Random Media; Remote Sensing; Phase-Locked Loops; Adaptive Arrays

Lee, T.N.—Professor of Engineering and Applied Science
Networks; Linear Systems

Loew, M.H.—Associate Professor of Engineering
Pattern Recognition; Medical Engineering; Image Processing

Martin, C.D.—Instructor in Engineering and Applied Science
Computer Literacy; Computers in Education; Computers and Society; LOGO
Maurer, W.D.—Professor of Engineering and Applied Science
Computer Science; Correctness of Programs; Analysis of Algorithms; Semantics of Programming Languages
Meltzer, A.C.—Professor of Engineering and Applied Science
Design of Computer Systems; Database Systems; Multiprocessor Systems; Hybrid Computation
Pickholtz, R.L.—Professor of Engineering and Applied Science
Data Communications; Computer Communications Networks; Communications Theory; Secure Communications
Rohlfs, D.C.—Associate Professor of Engineering
Specialized Measurements and Instrumentation; Electronic Devices; High-Power HF Systems
Rotenstreich, S.—Assistant Professor of Engineering and Applied Science
Software Engineering; Operating Systems
Sibert, J.L.—Associate Research Professor of Engineering
Computer Graphics; Human Computer Interaction
Zaghloul, M.—Associate Professor of Engineering and Applied Science
Linear and Nonlinear Circuits and Systems; Computer-Aided Network Analysis and Design; VLSI Modeling, Design, and Testing

Admission

In addition to the School of Engineering and Applied Science requirements for admission to graduate study toward the Doctor of Science degree (see pages 40–41), applicants for the Doctor of Science degree in the Department of Electrical Engineering and Computer Science must meet the following general and specific requirements.

General Requirements

The applicant must be recommended for admission by the Chairman of the Department of Electrical Engineering and Computer Science; must have a minimum quality-point index of 3.40 (on a scale of 4.00 maximum), or equivalent, in graduate course work leading to the master's degree; and must be adequately prepared in the basic sciences (physics, and chemistry or biology) and in mathematics (calculus through differential equations).

Language Requirement

Although a knowledge of a foreign language is often advantageous in pursuing graduate study, there is no formal requirement regarding a foreign language in the Doctor of Science program of the Electrical Engineering and Computer Science Department.

Specific Requirements

In addition to the above general requirements, the applicant must also satisfy through previous studies the following specific requirements according to the area of concentration (major area):

Communications

Nine semester hours of statistical theory of communications and 3 semester hours of information theory—EE 204, 241, 243, 244; or equivalent.

Computer Science (Software and Systems)

Twelve semester hours of computer programming and theory at the graduate level—CSci 215, 217, 232 and 258; or equivalent.

Computer Science (Hardware and Systems)

Twelve semester hours of computer design and theory at the graduate level—CSci 215, 217, 232 and 237; or equivalent.

Computer Science (Artificial Intelligence and Simulation)

Fifteen semester hours of computer science and numerical methods at the graduate level—CSci 215, 217, 221, 232, 281; or equivalent.

Electrophysics

Twelve semester hours of electronics and electromagnetic fields and waves at the graduate level—EE 201, 206, 207, 221; or equivalent.

Energy Conversion, Power, and Transmission

Twelve semester hours of electrical machines theory and networks at the graduate level—EE 261, 262, 264, 266.

Medical Engineering

Twelve semester hours of medical engineering at the graduate level—EE 280, 281, 282, 283; or equivalent.

Systems Science, Networks, and Controls

Twelve semester hours in network system analysis at the graduate level, including a knowledge of state-space and linear graph theory—EE 202, 204, 212, 272, 273; or equivalent.

An applicant who fails to meet the above specific requirements, but meets all other admission requirements, may be admitted with a program of study that is increased beyond the minimum requirements so that sufficient background material may be covered for doctoral studies.

Program of Study

At the time of admission, the graduate student pursuing a Doctor of Science degree in the Department of Electrical Engineering and Computer Science is assigned a faculty adviser in the major area of study. In consultation with the adviser, during the first semester the student will determine the two minor areas of study. Together they will formulate a program of study for the student, leading to the Qualifying Examination and complete the Graduate Program of Studies form (Form 1). Programs of study and any subsequent changes must be approved by both the faculty adviser and department chairman.

Major Area

The program of studies for the Doctor of Science degree will normally consist of one major area of concentration and two minor areas totaling a minimum of 30 semester hours of graduate-level courses (200 and above) beyond the master's degree level. A minimum of 15 semester hours must be taken in the major

area; a minimum of three courses designated with an asterisk in the list of areas of concentration must be included as part of the major area. A student who is changing the major area from that studied for the master's degree or who is missing specific admission requirements may be required to take additional courses to make up deficiencies. Such additional work normally should not exceed 12 semester hours.

Minor Areas

The student, in consultation with the faculty adviser, formulates a program of study that includes two minor areas as part of the total doctoral studies. For those students who take their minor area studies within the Department of Electrical Engineering and Computer Science, the following courses represent adequate programs in each minor area:

Communications—EE 204, 205 or 241, 243, and 244 or 249
Computer Science (Software and Systems)—CSci 159, 201, 217, 258
Computer Science (Hardware and Systems)—CSci 153, 154, 237, 238
Computer Science (Artificial Intelligence and Simulation)—CSci 159, 201, 221, 224
Electrophysics—EE 201, 206, 207, 221
Energy Conversion, Power, and Transmission—EE 261, 262, 264, 266
Medical Engineering—EE 280, 281, 282, 283
Systems Science, Networks, and Controls—EE 202, 212, 272, 273

Minor areas are not confined to the Department of Electrical Engineering and Computer Science but may be taken from other departments within the University such as Mathematics, Statistics, Operations Research, and Physics. Normally a minimum of three graduate-level courses constitutes a minor area.

Qualifying Examination

The qualifying examination for doctoral students in the department is composed of two parts. All incoming doctoral students must take the first examination within three regular semesters of the date of formal admission into the doctoral program. Students entering as unclassified students with prescribed deficiencies must take the first examination within five semesters of their entrance as unclassified students. This first examination is the department's Master's Comprehensive Examination (MCE) in the major area. The student must demonstrate superior performance to qualify formally as a student in the department at the doctoral level. The requirement to take this first examination is waived for a student who has received an M.S. degree from this department and, within two years prior to entrance, has demonstrated superior performance on the MCE. A student who fails to demonstrate superior performance must take the examination again in one of the two immediately succeeding semesters. A student may take the MCE only two times. Failure to show superior performance twice on the MCE in the major field will result in termination of the student's candidacy.

Upon completion of the student's formal program of study and after demonstrating superior performance on the MCE, the student is prepared to complete the qualifying examination. The purpose of the second part of the qualifying examination is to ascertain that the student's depth and breadth of

background and intellectual development are adequate to support doctoral research and investigation in the major area. The second part of the qualifying examination normally contains two sections, each of one day's duration. One section, a written examination covering only the major area of study, is given only in the spring semester each year. The other section is a written and/or oral examination covering one selected minor area. It is given once in the fall semester and once in the spring semester. Additional oral examinations may be required subsequent to written examinations. The student must pass the entire second part of the qualifying examination within, at most, two subsequent semesters of the semester in which any section is first attempted. A candidate who fails any section of the examination on the first attempt may take that section one more time, provided approval is given by the examining committee and provided the time limit of three semesters is not exceeded. Failure to pass the qualifying examination will terminate the student's candidacy in the doctoral program.

The questions on the qualifying examination are not limited to those specific areas in which the student has taken course work but are designed to demonstrate the student's ability to integrate the material from several course areas and from individual study and readings. Hence, the student should be familiar with the contemporary work of current journals and the contents of the books on the particular reading lists in the areas of examination, as well as those used in the course work.

Dissertation

After successfully completing the qualifying examination, the student makes arrangements for the assignment of a research director (not necessarily the student's faculty adviser), who selects an appropriate advisory committee. The duties of the advisory committee are to be aware of the student's dissertation development and, in conjunction with the research director, to give guidance to the student. After the student completes the dissertation, the advisory committee becomes the examining committee, with the addition of at least one new person. The dissertation should be of such quality that all or part is suitable for publication in the open literature. Doctoral students are encouraged to publish their work.

Graduate Courses

In addition to the Electrical Engineering and Computer Science graduate courses described below, the following undergraduate courses may be taken for graduate credit by certain majors if they are included in the student's Approved Program of Study. Students considering these courses should consult with their adviser. See the undergraduate section for course descriptions and restrictions.

EE 126: Introduction to VLSI Design and Simulation
EE 127: VLSI Fabrication Techniques
EE 128: Testing and Simulation of VLSI Circuits
EE 144: Elements of Communications Engineering Design II
EE 169: Advanced Electronics Design Laboratory
EE 178: Electrical Power Systems

EE 184: Medical Engineering Instrumentation and Systems Design
CSci 147: Assembly Language Programming of Microcomputers
CSci 153: Design of Switching Systems
CSci 154: Digital Computer Design
CSci 157: Assembly Language Programming of Large System Computers
CSci 158: Algorithmic Methods
CSci 159: Programming and Data Structures
CSci 161: Discrete Structures for Computing

Electrical Engineering Graduate Courses

The faculty member whose name appears at the end of each course description is the director for that course. The course director is not necessarily the instructor for any given semester.

201 **Natural Modes and Transients in Electrical Systems** (3)
Transient response and natural modes of electrical systems; techniques for analyzing systems with periodic and aperiodic inputs and outputs; Fourier and Laplace transforms. Inversion, integration in the complex plane. Sampling; discrete systems, Z transforms; applications. Prerequisite: graduate status. (Fall and Spring—evening) (Heller)

202 **Linear Systems Theory** (3)
An introduction to linear systems theory. Topics include linear vector spaces and linear operators, mathematical representation of dynamic linear systems, concept of state and solution of the state equation, controllability and observability, canonical forms of the state equation, state feedback, and state estimation. (Spring and Fall) (Zaghloul)

203 **Graph Theory and Applications** (3)
An introduction to oriented and nonoriented graphs. Topics may include graph theory applications to the routing problems of multiple printed circuits; circuit concepts of linear vector spaces; network analysis and synthesis, topological formulas; paths, reachability, connectedness, tree representations, transportation flows, and communications networks. Computer science applications such as storage representation and manipulation of computer data and other related techniques. (Spring, even years) (Zaghloul)

204 **Stochastic Signals and Noise** (3)
Probability, random variables, characteristic functions; transformations of random variables and applications; sequences of random variables, linear mean-squared estimation; stationary estimation, stationary random processes, correlation functions, power spectrum; output of linear systems with stochastic inputs; Gaussian processes. Applications drawn for communications, control theory, computer science. Prerequisite: ApSc 115 or equivalent. (Fall and Spring—day and evening) (Lang)

205 **Stochastic Processes in Electrical Engineering** (3)
Markov chains, state classification, Kolmogorov equation; applications to probabilistic finite-state machines. Birth–death process, applications to queuing theory, buffer problems, and the design of communication nets. Continuous state processes, diffusion processes, passage times, and estimation problems. Estimation and power spectra. Stochastic difference and differential equations. Applications to communications theory, control theory, computer science, and propagation theory of random media. Prerequisite: EE 204 or equivalent. (Spring—evening) (Lang)

206 **Electromagnetic Theory and Applications I** (3)
Brief review of vector-phasors and Maxwell equations, electromagnetic

potentials, power and energy; plane waves, frustrated total reflection, skin effect, anisotropic media; solution of radiation problems in the Kirchoff approximation; elementary applications. Prerequisite: EE 133 or equivalent. (Fall—evening) (Lang)

207 **Electromagnetic Theory and Applications II** (3)
Introduction to advanced techniques for problems in electromagnetics; leaky waves and complex wave types, stationary phase and steepest descent approximations for integrals in the complex plane. Discrete and continuous spectra. Application to optical fibers, surface and leaky wave antennas, ground wave propagation. Prerequisite: EE 206. (Spring—evening) (Lang)

208 **Digital Image Processing** (3)
Properties of images and visual systems. Picture description, sampling and quantization. One- and two-dimensional image transform techniques including Fourier, cosine, and Hadamard. Methods of image enhancement and restoration. Image coding and data compression techniques. Automated image analysis and recognition. Computer applications and projects. Prerequisite: EE 204. (Spring—evening) (Loew)

212 **Network Analysis** (3)
Network theorems, functions, and properties; relationship of parts of network functions; realizability and causality concepts. Introduction to the theory of nonlinear networks, nonlinear resistive network equation formulation, hybrid and other nonlinear equations. Nonlinear dynamic network equation formulation, state space, conditions for existence. Concepts of stability in nonlinear networks, conservative and Lagrangian networks and systems. (Fall, odd years) (Zaghloul)

213 **Computer-Aided Analysis and Design of Systems** (3)
Numerical solution of algebraic set of equations, Newton–Raphson and modified Newton–Raphson techniques, solution of algebraic equations with multiple solutions. Numerical solution of nonlinear ordinary differential equations, stability, stiff systems, steady-state solution of nonlinear periodically excited networks, computer-aided approach. Numerical optimization techniques, linear and nonlinear programming, gradient methods, unconstrained optimization, quasi-Newton methods, and penalty functions. Computer-aided sensitivity analysis of networks. Application in the design of large systems and in automated design. Prerequisite: EE 202 or 212. (Fall, odd years) (Zaghloul)

214 **VLSI Design** (3)
Design aids for VLSI systems. Design methodology, system specification, functional design, logic simulation tools, and design automation tools. Layout, routing, algorithms. Simulation techniques, process and device simulation, circuit simulation, timing and mixed-mode simulation, modeling, and module design procedures. Design testing approaches. System design aids, CAD data. Prerequisite: B.S.E.E. or permission of instructor. (Fall, even years) (Zaghloul)

215 **Linear Network Synthesis I** (3)
Properties and testing of positive real functions. Synthesis of *LC*, RL, RC one-port networks. Brune, Bott–Duffin, Miyata, Kuh, and Darlington synthesis techniques. Introduction to two-port ladder and lattice synthesis. Three-terminal RC network synthesis approximation in the frequency and time domains. Prerequisite: EE 202 or permission of course director. (Fall, even years—evening) (Lee)

216 **Synthesis of Active and Distributed Networks** (3)
Active network synthesis using negative resistors, control sources, NIC, operator, and operational amplifiers. Uniform and nonuniform distributed

network analysis and synthesis—computer-aided design. Prerequisite: EE 215. (Spring, odd years) (Lee)

217 Advanced Network Theory (3)
Modern methods for formulating network equations; mixed nodal tableau, state-space formulation. Mathematical methods for the solution of network equations, properties of nonlinear functions representing the nonlinear networks, losslessness and passivity in nonlinear networks, *n*-port networks. Piecewise linear networks analysis and techniques. Properties of nonlinear dynamic equations; existence and uniqueness of solution; stability and stability classification; Popov, Liapunov, steady-state analysis techniques of nonlinear periodic networks. Other selected topics. Prerequisite: EE 202, 212. (Fall, even years) (Zaghloul)

219 Digital Filter: Design and Realization (3)
Properties of transfer functions. Filter approximation, sensitivity, and computation techniques. Digital signals and systems, basic block of digital filters, stability consideration. Analysis of digital filters. Design of IIR and FIR digital filters. Computation techniques. Direct and indirect realization of digital filters. Microprocessor implementation. Applications and selected papers. Prerequisite: EE 202 or permission of course director. (Spring, odd years) (Zaghloul)

221 Physical Electronics I (3)
Theoretical principles underlying the operation of electronic devices; classical mechanics and classical statistical mechanics, the quantum theory, wave and matrix mechanics, quantum statistics. (Fall—evening) (Braun)

222 Physical Electronics II (3)
The Boltzmann transport equation, band theory of solids, time-dependent perturbation theory, group theory. Applications to semiconductor and other solid-state devices such as transistors, tunnel diodes, masers, and lasers. Prerequisite: EE 221. (Spring—evening) (Braun)

223 Optical Communications Systems (3)
Optical communications channels; survey of laser sources; modulation; line-of-sight links; system models and analysis; detection, photoemitters, photodiodes, and photoconductors; noise mechaniams and signal-to-noise analysis; optical fiber waveguides, electromagnetic field description of material, waveguide, and modal dispersion; optic fiber cabling, repeaters, and systems analysis; integrated optic components. Prerequisite: EE 207, 243. (Spring, odd years—evening) (Kahn)

224 Electronics of Lasers (3)
Basic concepts from quantum mechanics; Einstein coefficients; inversion and pumping mechanisms; rate equations. Resonators, He-Ne laser; organic dye lasers, injection lasers. Nonlinear interactions in lasers. Prerequisite: EE 222 or equivalent. (Fall 1981 and every third year thereafter—evening) (Kahn)

225 Nonlinear Electronics (3)
Analysis and design of electronic components and systems operating as switching, sweeping, gating, and pulse generators; study of multivibrators, negative resistance devices and amplifiers, nonlinear operation of oscillators. Prerequisite: EE 201 or equivalent. (Fall, even years—evening) (Heller)

226 Fiber and Integrated Optics (3)
Single-mode and multimode propagation in stepped-index and gradient-index optical fibers: scattering and attenuation characteristics of fibers, phase velocity, group velocity, impulse response, energy transport, ray tracing, Goos–Haenchen shift, Hamiltonian formalism; directional couplers, modulators, and deflectors in fibers and surface films; coupled-mode theory. (Spring, even years—evening) (Kahn)

227 Industrial Electronics (3)
Applications of electronic devices in industry; continuous and sampled

control systems; induction and dielectric heating; timing and counting circuits; reliability and automatic checking equipment; digital control of machine tools. Prerequisite: EE 201 or equivalent; graduate status. (Fall, odd years—evening) (Heller)

228 **High-Frequency Electronics** (3)
Design and analysis of the operation of electron-tube, solid-state, crossed-field, space-charge wave, and quantum maser oscillators and amplifying devices that lay the foundation of modern communications systems. Prerequisite: EE 207 or equivalent. (Spring, even years) (Heller)

230 **Design of Memory Devices** (3)
Physical principles of magnetic and semi-conductor memory devices. Design and manufacture of Ram's and disk files. Device and system characteristics reliability. Prerequisite: EE 122. (Spring, odd years) (Della Torre)

231 **Field Analysis and Potential Theory** (3)
General study of the theory of potentials as used to facilitate solution of problems in electromagnetic theory, mechanics, thermodynamics, optics, and gravitation. Emphasis on mathematical methods such as Green's functions, variational methods, principal axis transformations, and multidimensional analysis. Fourier transforms. Prerequisite: EE 207. (Spring 1981 and every third year thereafter—evening) (Heller)

232 **Electrodynamics** (3)
Special theory of relativity and the Lorentz transformation; Minkowski formulation. Maxwell's equations in the context of special relativity, electromagnetic potentials, and stress tensors. Lagrangian and Hamiltonian formulations, radiation from moving charges. Introduction to quantum electrodynamics. Prerequisite: EE 207. (Spring 1982 and every third year thereafter) (Braun)

233 **Microwaves and Components** (3)
High-frequency transmission lines and guided systems; matching techniques; scattering parameters; transfer parameters; directional couplers; cavity resonators; Faraday rotation; ferrite isolators and circulators. Prerequisite: EE 207. (Fall—evening) (Kahn)

234 **Electromagnetic Wave Propagation** (3)
Retarded time scalar, vector, and Hertz potential. Dipole and dipole array fields; Mie theory of electromagnetic scattering by spheres. Propagation in electrically and magnetically anisotropic media such as dielectric crystals, space-charge plasmas, and ferrites. Wave propagation in inhomogeneous media; Liouville transformation, Lagrange's variation of parameters, WKB solution, invariant imbedding techniques. Propagation in stochastic and dispersive media. Prerequisite: EE 207. (Spring, even years—evening) (Lang)

235 **Antennas** (3)
General solution of Maxwell's equations in terms of current sources, polarization, the far field approximations, radiation from current distributions, field equivalence theorems, the geometrical optics approximation, aperture antennas, receiving antennas, the theory of arrays, and applications to specific antennas and antenna types. Prerequisite: EE 207. (Spring, odd years—evening) (Kahn)

236 **Plasma Dynamics** (3)
Study of the interaction of fluids with electromagnetic fields. Generalized Navier–Stokes and energy equations, magnetogasdynamic and magnetohydrodynamic approximations, boundary-layer theory, statistical theory of turbulence, generalized Von Karman–Howarth equation, Boltzmann transport equation. MHD generators and devices. Prerequisite: EE 207. (Fall 1983 and every third year thereafter) (Braun)

237 Waves in Random Media (3)
Propagation and scattering of electromagnetic, optical, and acoustic waves in random media, scattering from rough surfaces and randomly distributed particles, turbulence. Applications to propagation through rain and fog. Laser beam scintillations, remote sensing, and communications channel modeling. Computer simulation by Monte Carlo techniques. Prerequisite: EE 204, 207. (Fall, even years—evening) (Lang)

238 Remote Sensing (3)
Description and analysis of active and passive remote sensing systems including scattermeters, real aperture imaging and synthetic aperture radars. Sensing of surface, subsurface and atmospheric parameters at microwave, infrared and optical frequencies. Analysis of radiometric techniques using radiative transport theory; inverse scattering methods; profile inversion. Prerequisite: EE 207. (Spring, odd years—evening) (Lang)

239 Numerical Laboratory in Electromagnetics (3)
Numerical methods for the solution of electromagnetic problems dealing with scattering by complex shapes, antenna design, transmission through anisotropic and dispersive media, electrodynamic interactions with charged particles. Convergence experiments dealing with moment methods, hybrid GTD, variational computations. Prerequisite: EE 207, CSci 100. (Spring, even years—evening) (Kahn)

241 Information Theory (3)
Measure of information, noiseless coding; communication channels, channel capacity, the noisy channel coding theorem; bounds on the performance of communications system; the Gaussian and binary symmetric channel; feedback communications systems; rate-distortion theory. Prerequisite: EE 204. (Fall—evening) (Pickholtz)

242 Coding Theory (3)
The PCM Communication System, mathematics of coding; groups, rings, and fields; linear codes: parity and generator matrices, syndrome error correction and deletion capability, minimum distance; performance bounds of linear codes, Hamming and Golay codes, polynomial algebras and Galois fields, shift-register implementation; cyclic codes: implementation and performance; BCH codes: encoding, decoding, minimum distance, the BCH decoding algorithm, burst-correction codes, convolutional codes, sequential and Viterbi decoding of convolutional codes. Prerequisite: EE 204. (Spring—evening) (Pickholtz)

243 Communication Theory I (3)
Optimum receivers for vector channels and for the additive white Gaussian noise channel; correlation detectors, matched filters; coherent and noncoherent detection and their error probabilities for simplex, orthogonal, and coded systems; bounds on the performance of communications in Gaussian noise; comparison of communications systems. Prerequisite: EE 204 or equivalent. (Fall—day and evening; Spring—evening) (Pickholtz)

244 Communication Theory II (3)
Schemes for efficient signaling for data sequences; effects of quantizing at the receiver. Practical implementation of orthogonal and simplex coded communication. Convolutional codes; bounds on performance decoding by sequential (Zigangirov–Jelinek, Fano) and MAP (Viterbi) algorithms. Fading and dispersive channels, diversity techniques and their performance. Topics from analog communications. Prerequisite: EE 243. (Spring—day and evening) (Pickholtz)

245 Signal Detection and Estimation Theory (3)
Statistical detection theory, hypothesis testing, sequential detection, estimation theory, maximum likelihood and Bayes methods, estimation of signal parameters and continuous wave forms, Wiener and Kalman filters, applications to the design of optimum receivers, adaptive systems. Prerequisite: EE 241, 244, or equivalent. (Fall—evening) (Pickholtz)

246 **Digital Communications** (3)
Digital transmission for data, voice, and video. Modern practice in data communication; voice digitization, PCM, delta modulation, linear predictive coding. Bounds for digital signaling, pulse dispersion and intersymbol interference. Nyquist criteria, eye openings; adaptive equalizers, decision feedback, partial response techniques. Regenerative repeaters; timing extraction, synchronization, and jitter. Transmission codes. Multiplexing and framing. Error control for data. Digital switching and integrated digital networks. Prerequisite: EE 241, 244, or equivalent. (Spring—evening) (Pickholtz)

247 **Communications Systems** (3)
Analysis and design of coherent communications systems. Phase-locked loop dynamics noise behavior and optimization. Parameter estimation theory and Wiener filters with application to optimum demodulation of analog waveforms (DSB-AM, SSB-AM, FM). Partially coherent digital demodulation. Comparative analysis of modulation systems. Frequency acquisition and synchronization. Selected topics in channel impairments and multiple access. Prerequisite: EE 241, 244. (Fall—evening) (Pickholtz)

248 **Computer Communication Networks I** (3)
(Formerly Data Communications Systems)
Introduction to data networks, common carriers, specialized carriers, and value-added networks. Operations, facilities, services, and tariffs. Data transmission over the telephone network. Channels, carriers systems, and hierarchies. Terminals, modems, multiplexors, concentrators, and communications processors. Coding for baseband transmission and error control. Data transmission via satellites. Local area networks. Interfaces and protocols. (Should be taken in sequence with EE 249.) (Fall—evening) (Helgert)

249 **Computer Communication Networks II** (3)
(Formerly Theory of Data- and Computer-Communications Networks)
Design and analysis of computer communications networks. Line, message, and packet switching. Traffic theory for data. Queuing models. Buffer design and statistical multiplexing. Delay and cost minimization, topological design algorithms. Network routing and flow control. Analysis of multiple access algorithms. Prerequisite: EE 204. (Should be taken in sequence with EE 248.) (Spring—evening) (Helgert)

250 **Telecommunications Security Systems** (3)
Mathematical theory of cryptography. Speech and data scrambling. Nonlinear transformations. Block and stream ciphers. DES algorithm and public key cryptography. Applications to data communications. Key management, digital signatures, and authentication. Data communication security protocols. Transaction-oriented security. Secure voice communications. Prerequisite: EE 204. (Companion course to CSci 229.) (Fall, even years—evening) (Pickholtz)

251 **Switched Telecommunication Networks** (3)
(Formerly EE 346, Communications Switching and Traffic Theory)
Switching technology: step-by-step, common control, stored program, electronic switching systems. Traffic models. Engineering of multiple server systems; analysis of multistage connecting networks. Digital time division and store and forward switches. Analytical bounds on the complexity of switched networks. Hybrid circuit-message switching. Large-scale switches, PEABX, and distributed switched networks. Prerequisite: Permission of course director. (Spring, even years) (Pickholtz)

252 **Digital Signal Processing Techniques** (3)
Signal representations, sampling and quantization, transform techniques. Recursive estimation, linear predictive filtering, recursive and nonrecursive

digital filter design. Computer-aided design. Prerequisite: CSci 51 or equivalent. (Fall, even years) (Zaghloul)

253 Sonar Systems (3)
Underwater sound propagation; transducer and transducer arrays; detection, localization, and tracking techniques; array processing; time compression correlation and digital processing of signals; effects of nonhomogeneous noise fields; applications to navigation and communications in the ocean environment. Prerequisite: EE 204. (Fall—evening) (Helgert)

254 Radar Systems (3)
The radar equation, range and resolution limits; MTI radars; detection and estimation techniques; clutter characteristics and detection in clutter; signal design; ambiguity functions; Doppler radar; phased arrays; synthetic aperture techniques; digital and optical processing and computer control. Applications. Prerequisite: EE 206, 243. (Spring—evening) (Helgert)

255 Optical Processing (3)
Fourier transforms by diffraction of light, optical spectrum analysis, optical memories and systems, holography and holographic techniques, properties and techniques for photographic reproduction. Prerequisite: EE 201. (Fall, even years—evening) (Kahn)

257 Secure Communications (3)
Spread-spectrum techniques, time and frequency hopping, direct sequence encoding. Link jamming models and jamming effectiveness. Adaptive null steering arrays, nulling algorithms, effects of intelligent jammers. Low probability of intercept. Prerequisite: EE 243. (Fall, even years) (Pickholtz)

258 Radio Communications Systems I (3)
Analysis and design of microwave communications systems for terrestrial, satellite, and over-the-horizon scatter radio channels. Propagation effects and channel characterization including refraction, reflection, multipath, scattering, and absorption. Effects of Earth curvature and characteristics of over-land and over-water propagation. Antenna considerations including gain, directivity, polarization, and antenna patterns. Frequency and time-division multiplexing and modulation techniques. Effects of noise, interference, and fading. Diversity techniques. Prerequisite: EE 206, 244. (Fall—evening) (Lang)

259 Radio Communications Systems II (3)
Morphology of the ionosphere, propagation of ionospherically reflected radiowaves, anomalous ionospheric propagation mechanisms, linear antenna structures, atmospheric noise, digital modulation techniques, nonGaussian channel performance, diversity, fading channel error control, typical VLF, LF, and HF system design. Prerequisite: EE 258 or permission of instructor. (Spring—evening) (Lang)

261 Electromechanical Energy Conversion (3)
Characteristics of synchronous machines, synchronous reactance, reactance theories, synchronizing generators and parallel operation of machines, characteristics of asynchronous machines, machines as circuit elements. Steady-state and dynamic performance of alternating current machines. Prerequisite: EE 202, 206, or permission of course director. (Fall—evening) (Harrington)

262 Power Electronics (3)
(Formerly Control of Rotating Machinery)
Dynamic requirements of industrial drives. Detailed analysis of inverter circuits. Frequency control of inverter drives and cycloconverters. Computer modeling of rectifier and inverter circuits. Feedback control loops and their effect on stability. Prerequisite: EE 177, or permission of course director. (Spring—evening) (Harrington)

263 Design of Reliable Emergency and Standby Power Systems (3)
General requirements and guidelines. Factors affecting power line distur-

bances. Characteristics and settings of system protection. Disturbance effects on computer power supplies. Grounding and noise control. Evaluation of reliability of power systems. Reliability evaluation from an economic viewpoint. Cost of power outages. Reliability of specific equipment. Practical application problems. Prerequisite: EE 202, 206, or permission of course director. (Spring—evening) (Harrington)

264 **Direct Electrical Energy Conversion** (3)
Theory and practice for direct production of electricity using solar cells, thermionic converters, fuel cells, and batteries. Concepts of solid-state energy bands, work function and conversion efficiency, and limitations. Prerequisite: EE 202, 206, and permission of course director. (Fall—evening) (Harrington)

265 **Transients in Electrical Power Transmission Lines** (3)
Theory of traveling wave phenomena in electrical power transmission lines. Switching and lightning surges and the resultant overvoltages on long lines for various terminations. Breaker closing sequence effects and effect of source side inductance and multiple infeeds. Recovery voltage after short line faults. Methods and effectiveness of protection. Analysis of transient corona and its effect on wave shape. Methods of automatic calculation of overvoltages in complex systems and insulation level requirements. Prerequisite: EE 202, 206, or permission of course director. (Fall, odd years—evening) (Harrington)

266 **Electrical Power Transmission I** (3)
EHV AC power transmission. Overhead line and underground cable transmission systems. Symmetrical components; short-circuit studies; load flow, transient stability, and sustained fault analysis; multimachine systems; machine and system modeling. Prerequisite: EE 178, 261, 265. (Spring, even years—evening) (Harrington)

267 **Electrical Power Transmission II** (3)
(Formerly Power Networks)
Practical studies using a computer in the following areas: load flow analysis, short-circuit analysis, transient stability, design of power system networks, insulation coordination. Prerequisite: EE 266. (Fall, even years—evening) (Harrington)

268 **Electrical Power Distribution** (3)
Transformer and insulation design at distribution voltage levels. Medium- and low-voltage switchgear requirements. Protective relaying, harmonic filtering, power factor correction, grounding systems. Prerequisite: EE 178, 202, and permission of course director. (Spring, odd years—evening) (Harrington)

269 **Issues in Electrical Power Generation and Transmission** (3)
(Formerly EE 369)
Assessment of various energy systems. Interfacing of different types of energy systems. Dispersed generation; concepts of conversion and cogeneration. Pollution control. Biological effects of high electric and magnetic fields. Prerequisite: EE 264, 265, 267, and permission of course director. (Spring, odd years—evening) (Harrington)

271 **Linear Multivariable Control Theory** (3)
Control of systems having multiple inputs or outputs. Topics useful in the control of multivariable systems include the algebraic theory of multivariable feedback; static and dynamic decoupling; invertibility; modal control; integrity; computer-aided frequency domain techniques such as feedback design, using inverse Nyquist arrays and characteristic loci design. Prerequisite: EE 172, 202, or equivalent. (Spring, even years) (Carroll)

272 **Computer Control Systems** (3)
An analysis of automatic control systems in which the control procedure uses

on-line digital computation. Topics include single- and multirate sampling, Z transforms, responses of discrete systems, stability criteria, discrete control design. Prerequisite or concurrent registration: EE 202 (Fall) (Carroll)

273 **System Optimization** (3)
Parameter optimization problems; theory of minima and maxima. Optimization problems for dynamic systems; calculus of variations; the maximum principle and the Hamilton–Jacobi equation. Optimization problems with constraints; optimal feedback systems. Numerical solution of optimal problems. Prerequisite: EE 203 or equivalent. (Spring—evening) (Carroll)

274 **Nonlinear Systems** (3)
Definition of linear and nonlinear systems; introduction to approximate analysis of nonlinear systems—describing functions, Krylov and Bogoliubov asymptotical method, and Tsypkin locus. Forced oscillations—jump resonance. Stability analysis—Liapunov criterion. Luré problem, and Popov method. Prerequisite: EE 203. (Spring, odd years—evening) (Carroll)

275 **System Identification and Adaptive Control Systems** (3)
Identification is the process of mathematically modeling a system based on measurement data that may be limited or uncertain. Adaptive control is the means whereby a system that is poorly modeled is controlled adequately. Various approaches to each of these problems are discussed, including the least-squares approach of identification and the stability approach to adaptive control. Prerequisite: EE 202, 204. (Spring, even years) (Carroll)

277 **Satellite Communications Systems** (3)
Theoretical and applications aspects of satellite communications. Modulation and multiple-access techniques. Link design. Satellite transponders and antenna systems. Ground stations. Random-access techniques and satellite packet communications. Prerequisite: EE 244. (Fall—evening) (Pickholtz)

278 **Spacecraft Systems Design** (3)
Space environment; structure, propulsion, control, and instrumentation of spacecraft—launch, orbit, transit, and re-entry problems; bioastronautic considerations. Prerequisite: graduate status. (Spring, even years—evening) (Heller)

279 **Stochastic Control Systems** (3)
Introduction to random process in control; properties of Markov process, systems of covariance equivalence and of deterministic and stochastic control equivalence; dynamic programming for Markov process—principle of optimality; linear systems with quadratic cost, Kalman filtering, smoothing, and predicting. The separation theorem and applications concepts of adaptive estimations. Prerequisite: EE 204, 273. (Fall, odd years) (Lee)

280 **Introduction to Medicine for Engineers I: Physiology and Anatomy** (3)
The physiology of the human body from a systems viewpoint; concepts of cellular structure and function integrated into the tissue and organs and related to the various systems of the body; interrelationships of the body systems, e.g., the interaction of the nervous system with the musculoskeletal system or the interaction of the respiratory system and its functions with the cardiovascular system. (Fall—evening) (Eisenberg)

281 **Introduction to Medicine for Engineers II: Physiology and Anatomy** (3)
Further elaboration of physiological systems, e.g., the endocrine system, renal physiology, gastrointestinal physiology; integration of the separate systems of the body to present the functioning of the body as an overall system. Prerequisite: EE 280. (Spring—evening) (Eisenberg)

282 **Medical Measurements I** (3)
Theory of measurements in biological areas, techniques for electronic measurements on biological specimens, current problems in medical metrology

stressing electronic systems. Prerequisite: EE 280 or permission of course director. (Fall—evening) (Eisenberg)

283 **Medical Measurements II** (3)
Medical telemetry systems, medical use of the computer, engineering techniques in patient treatment, principles of good medical instrumentation. Prerequisite: EE 280 or permission of course director. (Spring) (Eisenberg)

285 **Sensory-Evoked Potentials I** (3)
Physiological significance of the sensory-evoked potentials, stimulation variables, subject variables, data acquisition procedures and instrumentation, signal-averaging computers, analysis techniques for the VEP, applications of the VEP. Lectures, discussion, and laboratory. Prerequisite: EE 280, 281, 282, 283, or permission of course director. (Fall—evening) (Eisenberg)

287 **Rehabilitation Engineering** (3)
Application of engineering theory and techniques to the rehabilitation of handicapped persons; major problem areas and general approaches; solutions. Prerequisite: EE 281. (Spring, odd years—day) (Eisenberg)

289 **Clinical Engineering** (3)
A cross-sectional view of clinical engineering applications, functions, variations, and patterns in the medical and allied health care area. Use of instrumentation, computers, and systems by clinical engineers in hospitals and clinics. The clinical engineer in cardiovascular measurement systems and intensive care units; other areas where functional usage of clinical engineering is applicable. Prerequisite: EE 281. (Fall, even years—evening) (Eisenberg)

298 **Research** (arr.)
Research as arranged. May be repeated for credit. (Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

319 **Systems Science, Networks, and Controls Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

321 **Approximate Mathematical Techniques for Electromagnetics** (3)
Asymptotic methods for Maxwell's equations, geometric optics, WKB approximation for stratified media, uniform expansion near a caustic and shadow boundary; perturbation techniques for tenuous medium—Rayleigh Gans approximation, smoothing, and multivariable methods for stochastic problems. Prerequisite: EE 204, 207. (Spring 1982 and every third year thereafter) (Lang)

322 **Advanced Waveguide Diffraction and Design** (3)
Selections from the following: Analytical treatment of waveguide bifurcations and discontinuities by Wiener-Hopf, mode matching, static approximation, and other techniques. Small apertures (obstacles) in waveguides. Variational methods for evaluation of equivalent circuit parameters. Group theoretic methods for symmetrical junctions. Prerequisite: EE 233. (Fall 1982 and every third year thereafter) (Kahn)

323 **Principles of Microelectronics** (3)
Basic principles, techniques, and processes necessary for understanding microelectronics. Semiconductor physics, phase diagrams, crystal growth, epitaxy, vacuum techniques, thin-film deposition, diffusion, oxidation, junction formation, masking, and properties of thin films and materials. Prerequisite: EE 222 or equivalent. (Fall, odd years—evening) (Heller)

329 Electrophysics Research (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

345 Advanced Detection Theory (3)
Review of general estimation equations. Linear estimation; Weiner and Kalman–Bucy filters; nonlinear modulation theory; angle-modulation systems, analysis and design of phase-lock loops, optimum angle modulation, rate distortion theory; Gaussian processes in Gaussian noise, detection and parameter estimation, canonical receivers, structures, and performance calculations for diversity systems, multiple pulse radars, stationary processes, and threshold receivers. Prerequisite: EE 245. (Spring—evening) (Pickholtz)

347 Telecommunications Software Engineering (3)
(Formerly Data Communications)
Software of computer communication networks. Layered architectures. Network control programs; telecommunication access methods. High-level languages for presentation and application layers. SNA, DNA, and other current architectures. Prerequisite: EE 248, 251. (Spring, odd years) (Pickholtz)

349 Communications Research (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

364 Applications of Direct Energy Conversion (3)
Electrostatic and magnetic conversion systems, conversion of heat to electricity, thermoelectric systems, conversion of light to electricity, fuel cells and batteries, magnetohydrodynamic systems, superconductive machines and systems. Prerequisite: EE 264. (Spring, even years) (Harrington)

368 High-Voltage Testing Techniques for Electrical Apparatus (3)
Methods and procedures for measurement of high voltage; basic testing techniques for alternating voltages, direct voltages, lighting impulse voltages, switching impulse voltages, and impulse currents for conducting tests on all types of apparatus. General applications and requirements regarding test objects and test procedures. Determination of the dielectric strength of electrical insulation materials at commercial power frequencies. The use of sphere gaps for the measurement of peak values; the geometry of the standard sphere gap, its connections and use. Procedures for wet tests, contamination testing, and an application guide for measuring devices. (Spring, even years—evening) (Harrington)

371 Simulation Methods for System Analysis (3)
Survey of simulation languages. Techniques of model building for material- and machine-based systems. Treatment of these systems with notion of transactions and states. Modeling the dynamic processes of growth problems. Analog, hybrid, and digital methods for simulation treated by means of case studies; speed and cost of alternate computing procedures. Project-type problems used to illustrate simulation methods. Prerequisite: CSci 278 or permission of course director. (Fall, odd years—evening) (Bock)

372 Analysis and Control of Large Systems (3)
Systems as multistage decision processes. Analytical concepts of model making and matrix representations of large systems. Approximation by models of lower dimension—reduction to simplified models; decentralized systems. Differential games; computation of saddle points; construction of an equilibrium point. Prerequisite: EE 273. (Fall, even years—evening) (Lee)

381 Computer-Aided Analysis of Physiological Signals (3)
Computer analysis of physiological data obtained from the cardiovascular pulmonary, and nervous systems. Sources and detection of various signals obtained from these systems; preprocessing of real signals; algorithmic

techniques applicable to the analysis of these signals. Students are provided with real data and develop computer software for determining pertinent medical parameters as established by physicians. Prerequisite: EE 280, 281, 282, 283, and working knowledge of FORTRAN. (Fall, even years—evening) (Loew)

382 **Physiological Controls and Systems** (3)
Some applications of control and systems theory in the medical and biological fields. Application of general control and systems theory as applied to physiological systems. Specific applications of control and systems theory to the visual system, respiratory system, cardiovascular system, and musculoskeletal system. Prerequisite: EE 172 or equivalent, 280, 281, 282, 283. (Spring, even years—evening) (Loew)

384 **Medical Imaging** (3)
Principles of medical imaging by projection radiography, fluoroscopy, tomography, ultrasound, and nuclear sources. Characterization of source and object; recorder resolution and noise; analysis of scatter, energy considerations; attenuation; computerized tomography. Mathematics, algorithms, and implementation. Ultrasonic imaging in A-, B-, and M-modes; tissue characteristics; imaging using arrays. Nuclear imaging with gamma-ray cameras, Anger camera, positron emission tomography. Prerequisite: EE 201 or equivalent, 280, 282, 283. (Fall, odd years—evening) (Loew)

385 **Sensory-Evoked Potentials II** (3)
A continuation of EE 285. Advanced lecture, discussion, and laboratory. Current topics in sensory-evoked potentials research; emphasis on clinical applications. Planning and conducting an advanced (clinical or research) project chosen to take maximum advantage of the student's technical background from an instrumentation, computer, and data analysis viewpoint. Prerequisite: EE 285, permission of course director. (Spring, odd years—evening) (Eisenberg)

386 **Bioelectromagnetics** (3)
Electrical properties of biological tissues. Mechanisms for electromagnetic interactions with biological systems. Energy absorption and heat production. Non-ionizing radiation dosimetry and quantification of microwave and radio frequency hazards. Temperature measurement in the presence of a strong electromagnetic field. Physical aspects of diathermy and hyperthermia. Other therapeutic and diagnostic applications of electromagnetic energy. Prerequisite: EE 31, 32, 280, 281; or permission of instructor. (Fall, odd years—evening)

387 **Bioelectric Phenomena** (3)
Mathematical treatment of selected bioelectric phenomena. Membrane thermodynamics; membrane electrical potentials and subthreshold membrane effects; membrane dynamics. Solid-state phenomena in biology and medicine. Photoconduction. Mechanism of nerve propagation. Electrical models of the heart. Cell physiology. Quantum effects in biological systems. Prerequisite: EE 206, 280, 282, 283. (Spring, even years—evening)

389 **Medical Engineering Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

390 **Colloquium** (0)
Formal lectures by outstanding authorities in electrical engineering and computer science. Topics to be announced each semester. (Fall and Spring) (Lang)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)

*450 **Telecommunications System Concepts** (3)
(Formerly EE 250)
Essential elements of an electrical communications system: speech, TV, and data signals; spectrum, bandwidth, sampling. Amplitude, frequency, and pulse code modulation and comparative performance. Multiplexing schemes, communications quality standards, and objectives. Signal power, noise power, distortion, and channel capacity. Probability, traffic theory, reliability, voice, TV, and data transmission. Telecommunications, microwave radio, cable, and satellite communications systems. (As arranged) (Pickholtz)

*451 **Survey of Telecommunications Systems** (3)
(Formerly EE 251)
Design of a communications link for voice, TV, and data. Loading; the switched telephone network. Transmission system layout and major design considerations. Overall system design of microwave radio system. Radiowave propagation fundamentals. Satellite communications, factors affecting the choice of orbit and orbital separation of satellites, satellite transponder. Major design considerations and values of significant parameters for a typical satellite communications link. Overall design of a cable communications system. Digital transmission and terminals. Wideband data transmission. Frequency allocation. (As arranged) (Pickholtz)

Computer Science Graduate Courses

The faculty member whose name appears at the end of each course description is the director for that course. The course director is not necessarily the instructor for any given semester.

201 **Introduction to Computer Systems** (3)
Introduction to programming digital computers in high level and assembly languages. Architecture of traditional von Neumann and stack-based computers. Techniques in machine control and memory addressing. Number systems and codes. Software engineering. Introduction to parsing, compiling, and meta-language. Stacks and recursion. (CSci 201 is equivalent to CSci 157 or 147, and 158.) Prerequisite: CSci 51 or 100 or equivalent (FORTRAN) and programming experience using assembly language. May not be taken for graduate credit by majors in computer science. (Fall and Spring—evening) (Bock)

203 **Microprocessors and Microcomputers** (3)
Microcomputer structure and components. Microprocessor architecture, registers, ALU, stacks, information flow, and control. Microprocessor support hardware, RAMs, ROMs, PLAs, counter timers. Hardware and software of typical 8-bit microcomputers. I/O structure in microcomputers; interrupts and DMA operations. 16-bit microprocessors, hardware structure, and software capabilities. Bit-slice microprocessors. Prerequisite: CSci 147 and 154 or permission of course director. (Fall and Spring) (Friedman)

212 **Discrete Analysis in Computer Science** (3)
Formal systems, fundamentals of graph theory, combinatorics and combinatorial algorithms, complexity theory, discrete probability, and the generation of random variables and sequences and probabilistic algorithms. Applications to the analysis of algorithms, simulation, and other problems in

* EE 450 and 451 cannot be applied toward a graduate degree in the School of Engineering and Applied Science.

computer science. Prerequisite: CSci 161 or permission of instructor. (Fall—evening) (Pickholtz)

215 **Advanced Data Structures** (3)
Sparse matrix transpose and multiplication. List insertion and deletion, lists of available space. The boundary tag method, the Deutsch–Schorr–Waite algorithm, the Knuth–Morris–Pratt algorithm. In-order, preorder, and post-order traversal of trees, alpha–beta pruning. Tarjan's UNION and FIND. Depth-first and breadth-first search, Kruskal algorithm, topological sorting, shortest paths in a graph. Quicksort, heap sort, radix sorting, merge sorting, sorting of files. Binary search trees, including AVL trees. B-trees, and tries. Hashing and collision handling. Critical paths and PERT. Prerequisite: CSci 159. (Spring—evening) (Berkovich)

216 **Information Retrieval Systems** (3)
Information organization and retrieval of natural language data by digital computer systems; statistical, syntactic, and logical analysis of natural language used for retrieval systems; dictionary systems including thesaurus look-up and phrase structures; searching strategies and cataloguing. Input preparation and output structures; large-scale file structures and operating systems required for their use. Prerequisite: CSci 159 or permission of course director. (Spring—evening) (Berkovich)

217 **Computing Algorithms** (3)
Design and analysis of five classes of algorithms: greedy dynamic programming, tree and graph traversals, backtracking, branch-and-bound. Applications to problems such as sorting and searching, graph coloring, traveling salesperson, knapsack, and code generation. Lower bound theory. NP-hard and NP-complete problems. Prerequisites: CSci 159, 161. (Fall and Spring—evening) (Berkovich)

219 **Interactive Computer Graphics I** (3)
Architecture and implementation of display and interaction devices. Interactive graphics programming. Functional capabilities of graphics packages. Implementing a graphics package. Two- and three-dimensional viewing, clipping, and transformations. Interaction techniques and human factors. Raster graphics scan-conversion algorithms. Hidden surface and hidden edge removal algorithms. Shading and texturing techniques. Prerequisite or concurrent registration: CSci 159 or permission of course director. (Fall and Spring—day or evening) (Foley)

220 **Pattern Recognition** (3)
Applications of pattern recognition, vector spaces, estimation and samples; Bayes estimation; density functions; stochastic approximation; decision rules in pattern recognition, minimal risk, Gaussian filters; bounds of risk, nearest-neighbor decision rules; clustering techniques, feature extraction. Sequential and nonparametric methods. Pattern recognition with *a priori* knowledge. Introduction to syntactic methods. Computer applications and projects. Prerequisite: EE 204. (Fall—evening) (Loew)

221 **Simulation and Heuristics** (3)
Techniques of deterministic and probabilistic simulation on the digital computer. Mathematics for simulation; design of systems modules; random number generation and testing. Markovian and bounded context systems; generation of stochastic variates; Monte Carlo techniques; heuristics; verification techniques; simulation languages. Prerequisite: ApSc 115, CSci 159, and permission of course director. (Fall—evening) (Bock)

222 **Design of User–Computer Dialogues** (3)
Design of dialogues for interactive terminal systems, including graphics systems. Psychological, physiological, linguistic, and perceptual factors. Advantages and disadvantages of various interaction techniques, command

language syntaxes, and data presentations. Design methodology and guidelines. Case studies, research readings, and projects. Prerequisite: CSci 159 or permission of course director. (Spring—day or evening) (Foley)

223 **Computational Heuristics** (3)
Learning stochastic automata theory. Collective and hierarchical automata. Markovian and bounded context systems. State transition descriptions of processes. Environment policies. Stationary and nonstationary compensation policies. Update algorithms. Algedonic processes. Optimality and expediency criteria. Application of inductive learning methods to artificial intelligence. Expectation and confidence criteria for verification. Class projects to illustrate heuristic methodologies. Prerequisite: CSci 147 or 157; 221. (Spring—evening) (Bock)

224 **Artificial Intelligence** (3)
Survey of topics. Analogies and simple concepts. Symbol manipulation and programming in LISP. Networks and simple learning. Scene analysis and sentence analysis. Programming the BLOCKS world. Depth-first and breadth-first searching, hill climbing, network searching, min–max and alpha–beta pruning. Problem-solving systems. Prerequisite: CSci 159. (Spring—evening) (Bock)

226 **Robotics** (3)
Industrial automation. Manipulator and sensor technology. Feedback loops and analog servos. Multiple degrees of freedom and coordinate systems. Joint-space/work-space transformations and data structures. Point-to-point continuous path control. Robot control: command languages, navigation and mapping, optical and acoustic ranging and pattern recognition, collision avoidance algorithms, positioning accuracy, resolution, and repeatability. Distribution of intelligence. Adaptive hierarchical control. Class projects using the Mobile Robot in the Interactive Systems Lab. Prerequisite: CSci 221 or permission of course director. (Spring—evening) (Bock)

227 **Management Information Systems and Database Management** (3)
Concepts in management information systems. Commercial programming features of COBOL and PL/I. Inverted files and query systems. Editing, report generation, updating, and updating load. Trade-off between direct access and indexed-sequential access. Maintaining large programming systems that lead to the need for database management systems; construction of database management systems. Survey of some existing database systems. Relational database concepts and future developments. Conceptual and logical design of a database. Prerequisite: CSci 159. (Fall—evening) (Berkovich)

229 **Computer Security Systems** (3)
(Formerly Security and Privacy in Computer Systems)
Techniques for security of data and programs in computer systems. Authentication methods, logging, authorization, encryption, statistical inference controls. Effects of operating systems and machine architecture on security. Cost trade-offs among various countermeasures. Information flow models. Automated and manual risk analysis systems. Related nontechnical measures. Prerequisite: CSci 159 or equivalent. (Companion course to EE 250.) (Fall—evening) (Hoffman)

*230 **Information Policy** (3)
Topics of current interest in information policy, including privacy, freedom of information, antitrust and other business implications of policies, transborder data flow, information as a weapon, cryptographic policy, international aspects of information law and policy, technology transfer, electronic funds transfer, electronic mail, criminal justice information systems, and cross-

* CSci 230 is not counted as part of the major course offerings in computer science.

cultural implications and the lower classes. Prerequisite: CSci 100 or equivalent. (Spring—even years) (Hoffman)

231 **Sequential Machines** (3)
Finite state sequential machine theory and design, state identification, information losslessness, state minimization in incompletely specified tables partition theory, decomposition of machines, asynchronous machine design, structural simplicity and design with ROMs and PLAs (Planar Logic Arrays). Prerequisite: CSci 153. (Fall—evening) (Friedman)

232 **Automata and Formal Languages** (3)
Regular expressions including equality and transformations between sequential machines and regular expressions. Turing machines, recursive functions, predicate calculus, and computability. Complexity of algorithms. Formal language theory including grammatical construction, recognizers, relationships between machines and grammars. Nondeterministic automata. Prerequisite: CSci 212. (Spring, odd years—evening) (Feldman)

237 **Computing Systems I** (3)
Organization of large computing systems. Design of high-speed integer decimal and floating-point arithmetic units. Pipelined instruction and execution units. Array and vector processors, multi-processors and overlap. Look-ahead and parallelism in control processors. Trends in processor design. Prerequisites: CSci 154 and either CSci 147 or 157. (Fall) (Meltzer)

238 **Computing Systems II** (3)
Organization of large computing systems. Memory hierarchy. Analysis and design of cache memory, main memory technology. Analysis of interleaved memory. Secondary storage devices. Analysis of data movement from secondary storage. Virtual memory systems. Input/output subsystems and channels. Analysis of I/O overlap. Introduction to computer networking. High-reliability architectures. Prerequisite: CSci 154. (Spring) (Meltzer)

239 **Comparative Computer Systems** (3)
Structures of computers and a general language for system description. History of different computer structures. Development of the operating system. Special purpose processors. Multiprocessors and large computing systems. Computer networks and time-shared systems. Comparison of computer families. Characteristics and philosophies of computer design of the major manufacturers. Introduction to performance evaluation and measurement. Effects of software and technology on computer structures. Prerequisite: CSci 237. (Spring—evening) (Meltzer)

240 **Theory and Practice of Microprogramming** (3)
Basic concepts, techniques, and theory of microprogramming as applied to the implementation of control systems for sequential machines. Microprogramming languages, assemblers, and hardware simulators, including specific applications of these to the design of current computer systems and their interfaces with real-time systems. Prerequisite: CSci 147 or 157; 237. (Spring—evening) (Friedman)

243 **Fault Tolerant Systems and Design Automation** (3)
Fault test generation for combination and sequential circuits, digital simulation as a diagnostic tool, design of easily tested and fault tolerant systems. Physical packaging of digital circuits; design of circuit boards including partitioning, placement, and interconnection of elements. Prerequisite: CSci 153. (Fall—evening) (Friedman)

244 **Data Communications** (3)
Principles and practice of modern data communications. Modes for data transmission; terminals, modems, multiplexors, concentrators. Line control procedures. Protocols for buffer management, message reassembly, queue control. Distributed processing; terminal-oriented systems, data collection

loops, multidrop lines. Switched data systems; circuit and packet switching. Error control, cryptosecurity. Hardware and software interfacing. Prerequisite: EE 243; CSci 201 or permission of course director. (Spring—evening) (Meltzer)

245 **Advanced Computer Systems Theory I** (3)
Analytical models applied to computing systems. Determinance, deadlocks, concurrency, and synchronization of computer processes. Optimal task scheduling using linear graph theory. Concurrent processes in multiprocessors. Analysis of the overlap of I/O and CPU processing. Queuing theory applied to time-shared computer models. Analysis of secondary storage devices and effective data rate. Analysis of memory buffer pools and multiprogrammed memory allocation. Memory allocation and storage hierarchy operation and their effect on throughput and response time. Prerequisite: EE 204; CSci 206, 237. (Fall—evening) (Meltzer)

246 **Advanced Computer Systems Theory II** (3)
Optimum secondary storage placement algorithms to improve throughput. Modeling of secondary storage operation and data staging. Analysis of memory allocation algorithms to improve system performance. Characteristics of computer system hardware and software to provide for multiprocessing, multiprogramming, and time-shared operation. Loosely and tightly coupled multiprocessors. Analysis of front-end processors in database operation and computer networks. System analysis of a large time-shared, terminal-oriented transaction processing system. Prerequisite: CSci 245. (Spring—evening)

247 **Language for Systems Programming** (3)
Use of a macroassembler in structured programming. Conditional assembly. Design and programming of an assembler, macrogenerator, and loader. Prerequisites: CSci 147 or 157; CSci 159. (Spring—evening) (Maurer)

255 **Analysis and Correctness of Algorithms** (3)
Basic tools of analysis of algorithms. Space and time measures, O(n) and O(f(n)), computer time versus programmer time. Divide-and-conquer, backtracking, branch-and-bound. Lower bounds on computations. NP-hard and NP-complete problems. Correctness, partial correctness, termination, run-time errors. The inductive assertion method, verification conditions and their generation and proof. Applications to algebraic and assembly languages. Prerequisite: CSci 159. (Fall—evening) (Maurer)

256 **Design of Translators** (3)
Introduction to programming language implementation. Overview of compilers, interpreters, and assemblers. Lexical analysis. Introduction to classical parsing techniques. Symbol tables and static semantic analysis. Code generation and run-time environments. Writing a recursive-descent compiler for a simple block-structured language. Prerequisites: CSci 147 or 157, 159, 232. (Spring—evening) (Denbaum)

258 **Advanced Programming Languages** (3)
Issues in modern programming languages. Data abstraction. Classical and experimental control structures, including elements of functional programming. Concurrency and exception handling. Portability and standardization of programming languages. Student programming projects will compare alternative models as embodied in languages such as ADA, Modula-2, Lisp, Snobol4, C, and AFL. Prerequisite: CSci 159. (Fall and Spring—evening) (Feldman)

267 **Operating Systems I** (3)
Introduction to the operating system for batch-oriented multiprogrammed computer systems. Software components that constitute the operating system. Facilities of the macroassembler utilizing the operating system; loading and linking routines; initializing programs and tasks; dispatching and the interrupt mechanisms. Memory management in fixed and variable parti-

tions; device and storage management. Input–output control and use of access methods. Performance evaluation. Prerequisite: CSci 247. (Fall—evening) (Hoffman)

268 **Operating Systems II** (3)
Introduction to operating systems for time-shared and multiprocessor computer systems. Processor management in a multiprocessor system; deadlocks, processor utilization, and I/O management. System availability and fail-soft mechanisms. Time-slicing and time-sharing operating systems and subsystems; transaction processing subsystems; memory management in a paged and segmented virtual memory system. Performance of the operating system. Computer network software and an introduction to the computer as a utility. Introduction to security and large database management. Prerequisite: CSci 267. (Spring—evening) (Hoffman)

281 **Numerical Solutions of Algebraic Systems** (3)
(Formerly Applications of Numerical Methods I)
Numerical solutions of linear algebraic equations and the algebraic eigenvalue problem. Sparse matrix techniques. Solutions of nonlinear simultaneous equations. Multidimensional search algorithms. Interpolation and extrapolation. Prerequisite: CSci 155. (Fall) (Della Torre)

282 **Numerical Solutions of Field Problems** (3)
(Formerly Applications of Numerical Methods II)
Finite difference and finite element methods for the solution of second-order elliptic partial-differential equations. Approximation of boundaries. Graphical presentation of results. Methods of acceleration of convergence. Direct and iterative methods, including SOR and ADI. Prerequisite: CSci 281. (Spring, even years) (Della Torre)

283 **Numerical Solutions of Wave and Diffusion Problems** (3)
Numerical solutions of parabolic and hyperbolic partial-differential equations. Solution of eigenvalue problems using the Rayleigh quotient. Solution of integral equations. Applications to devices and antennas. Prerequisite: CSci 281. (Spring, odd years) (Della Torre)

285 **Approximation of Functions and Data Representations** (3)
Review of linear spaces; least squares, orthogonal functions; nonlinear techniques, gradient search methods; parameter estimation with discrete data; Tchebysheff approximation; approximation and curve fitting by spline functions and Bernstein polynomials. Prerequisite: CSci 281. (Fall—evening, at NASA–Langley Research Center; Fall, odd years—evening, on campus) (Meltzer)

298 **Research** (arr.)
Research as arranged. May be repeated for credit. (Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

319 **Interactive Computer Graphics II** (3)
Hidden surface algorithms, mathematics and data structures for surface representation, surface texture models, color models, animation, simulation, graphics programming languages, architecture of high-performance hardware, solid modeling, current topics. Prerequisite: CSci 219. (Spring, odd years—evening) (Foley)

324 **Knowledge Based Systems** (3)
The design, structure, and application of expert systems in artificial intelligence. Knowledge representation, databases, inference engines, rule sets, and user interfaces. Specific tools used to build expert systems, including semantic networks, frame systems, and deduction/inferencing mechanisms. Applications of expert systems including consultation, CAI support, circuit analysis, intelligent frontends, and planning systems. Examination of case

studies, including EMYCIN, SACON, PROSPECTOR, TERESIAS, GUIDON, and SOPHIE. Prerequisite: CSci 224. (Fall) (Bock)

327 **Advanced Topics in Information Systems** (3)
Special topics: architecture of information systems, organization of large dynamic files, multidimensional search, user interfaces, and database machines. Students are encouraged to present reports in information systems research. Prerequisite: CSci 159 and one of 215, 216, or 226, or permission of course director. (Fall, odd years—evening) (Berkovich)

337 **VLSI Systems Organization and Applications** (3)
Impact of VLSI on the philosophy of computer systems design. Computational models for concurrent processing. Data flow. Processor arrays. Associative processing. Computer communications. Redundancy and reliability. Fault tolerance. Parallel algorithms and organization of highly concurrent computations for large scale problems. Specialized applications of VLSI systems. Prerequisite: CSci 277, EE 214. (Fall, even years) (Berkovich)

356 **Seminar in Programming Design and Implementation** (3)
Topics to be selected by instructor. Topics may include the following. Approaches to programming language design. Models and methodologies. Top-down and bottom-up parsing techniques. Code optimization techniques. Compilation techniques for special language features such as parallel processing, coroutines, abstract data types, as well as nonprocedural languages. Incremental compilers and programming environments. Portability issues; translator writing systems. Prerequisites: CSci 256, 258. (Fall—evening, alternate odd years) (Denbaum)

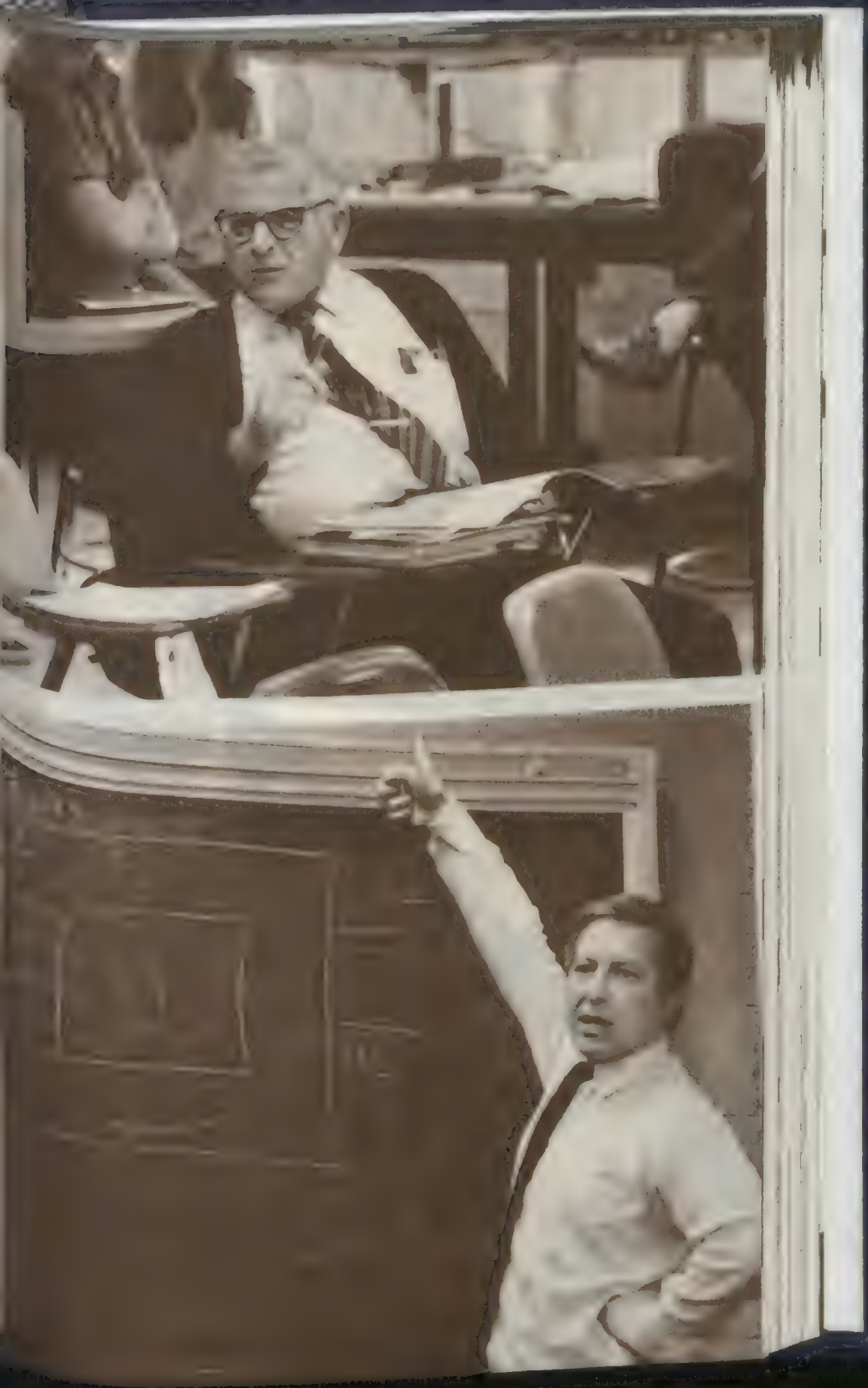
358 **Concurrency and Parallelism in Programming Languages** (3)
Models as embodied in current and experimental programming languages for the support of concurrency and parallelism. Recent work by Iohbiah, Dijkstra, Hoare, Brinch-Hansen, Liskov, and others. Tasks and rendezvous, semaphores, synchronization, monitors, and message passing. Language support for distributed processing. Comparison with the "functional programming" model. Examples of languages considered: ADA, CONCURRENT, PASCAL, MODULA-2, MESA, EDISON, and CSP. Student projects incorporate "hands-on" experience where feasible; emphasis on comparison of alternative strategies. Research paper required. Prerequisite: CSci 258 or permission of instructor. (Spring, even years) (Feldman)

390 **Colloquium** (0)
Formal lectures by outstanding authorities in electrical engineering and computer science. Topics to be announced each semester. (Fall and Spring) (Lang)

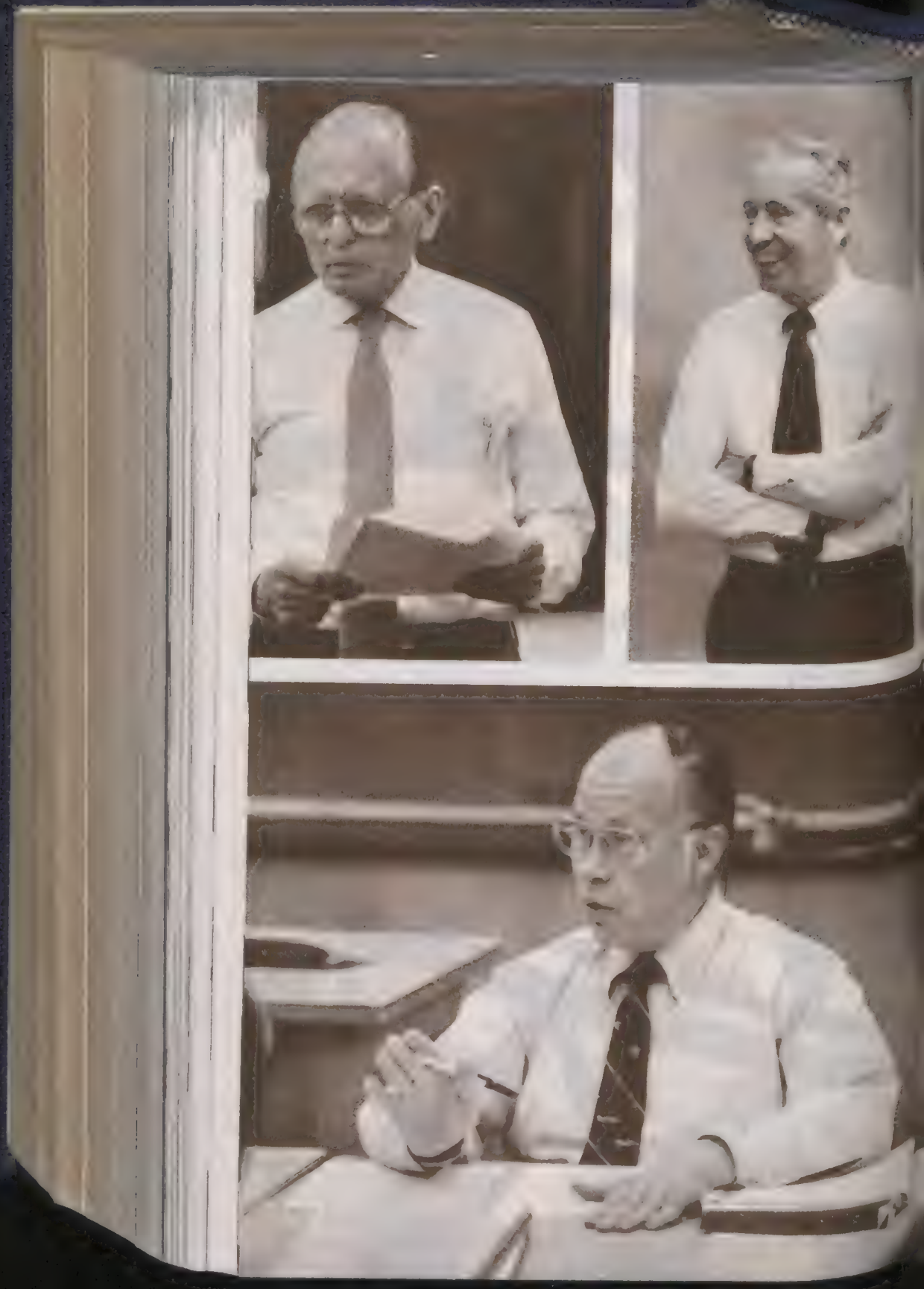
391 **Computer Science Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)






Engineering Administration
KOUKOS





Engineering Administration

Professors P.S. Shane, J. Kaye, M. Apstein *(Research)*, S. Rothman, H.M. Steiner, R.C. Waters *(Chairman)*, H. B. Sewell
Adjunct Professor J.E. Duberg
Professorial Lecturers J.B. DuPeza, C.W. Fotis, G.T. Malley, D.P. Hearth, J.A. Belding, Jr., R.A. Hemmes, D.R. Levin, E.S. Hoe, G.W. Leonard, R.L. Bangert, L.H. Blakey, W.A. Goetz, W.J. Wenker, R.J. Lynch, Jr., G.M. Hollander
Associate Professors B.G. Silverman, J.F. Dinwiddie
Associate Professorial Lecturers C.A. Kottman, P.D. Rosenberg, J.R. Margulies, J.P. Solomond, R.R. Blanchard, K.D. Wade, S.F. Pauls, V.R. Hayles, J.F. McNulty, R.E. Snyder, I.S. Raju, H.S. Kimmel, J.L. Pokorney, H.J. Peake, R.W. Doyon, R.R. Romano
Assistant Professorial Lecturers J.D. Liveris, R.B. Reynolds, M.P. Clark, J.H. Rossi, J.S. Tulenko, J.F. Patrick, K.M. Asrat, J.P. Wenzelberger, W.L. Taylor III, J.J. Stewart, R.B. Davis

Graduate programs are offered by the department in engineering administration, systems analysis and management, and information management.

Graduate Study in Engineering Administration and Areas of Concentration

Programs in Engineering Administration lead to the Master of Engineering Administration, Professional, and Doctor of Science degrees. Included are a general program in engineering administration and programs in administration of research and development, artificial intelligence and human factors, construction management, environmental and energy management, marketing of technology, technology and public affairs, public works management, and transportation management.

Master of Engineering Administration Degree Program

The principal objective of the program leading to the degree of Master of Engineering Administration is to prepare students whose undergraduate education was in engineering, natural science, or mathematics, as reflected by an appropriate degree, for positions of managerial responsibility in technological and scientific organizations in industry, government, or the armed services.

The program consists of a minimum of 24 semester hours of approved graduate courses and a master's thesis (equivalent to 6 semester hours). With the approval of the department the student may elect an optional program without a thesis, which consists of a minimum of 33 semester hours of approved graduate courses.

The program is designed to help the student achieve a broad understanding of the administrative process. Although years of experience are required to develop the skills, insight, and mature judgment that distinguish an effective manager in technological and scientific organizations, a graduate professional management curriculum can give the student an effective start as a manager. The curriculum provides an opportunity to gain understanding and to develop useful managerial skills in the functional areas of engineering administration.

One of the major purposes is to assist the student in forming the habit of examining problems from an overall managerial point of view. The individual's own particular experience and the explicit process of relating this experience to graduate study provide each student with a personal frame of reference to interpret management in a rapidly changing world.

Successful education for engineering administration gives an understanding of what it is that an engineering manager must do, an analysis of the broad functions involved in management, and a detailing of modern methods useful in making and executing decisions in the management of technological and scientific organizations. It is the aim of the department, therefore, to keep alive a spirit of general inquiry and a decision-making orientation.

The management of technological organizations is one of the most difficult challenges of our times. The professional engineering manager today must understand not only currently developing technologies but also the rapidly changing marketplace where these technologies are applied for society's benefit. The engineering administrator is the link between these dynamic technologies and the needs of society in general.

In summary, the program of study has for its objective an educational experience that will contribute to the development of managers possessing a combination of technical know-how and administrative skill.

Admission

The principal objective of the program leading to the degree of Master of Engineering Administration is to prepare students whose undergraduate education was in engineering, natural science, or mathematics for positions of managerial responsibility in technological and scientific organizations.

In addition to the requirements for admission to graduate study (see pages 31–33), applicants for programs leading to the degree of Master of Engineering Administration must meet the following requirements: (1) The applicant must have basic knowledge of the principles of management, the fundamentals of engineering economic analysis, and the fundamentals of quantitative methods. This requirement can be met by satisfactory completion of EAd 150, 160, and 170 or approved equivalents. (2) The applicant may be required to complete other undergraduate prerequisite courses prescribed as a condition of admission. A student is required to earn the grade of *C* or better (unless the requirement is stipulated to be a grade of *B* or better upon admission) in each undergraduate prerequisite course. If this scholarship requirement is not met, the student is barred from further enrollment. Credit for prerequisite courses is not applicable toward the degree of Master of Engineering Administration, and unless approved by the department chairman, all prerequisite courses must be completed prior to taking graduate courses in this degree program.

A student must be accepted in a graduate program to receive credit for any graduate courses taken to satisfy degree requirements.

Master's Comprehensive Examination

A student must pass a Master's Comprehensive Examination. The examination is scheduled three times a year. On the prescribed form and prior to the deadline, students must notify the department of their intent to take the examination. Thereafter, requests to withdraw must be submitted in writing in advance of the examination date. Unexcused absence constitutes a forfei-

ture and is regarded as a failure of the examination. The examination lasts four hours. The student must demonstrate the ability to apply what has been learned while pursuing a formal graduate program. The examination is drawn from the prerequisite courses and core courses; however, answers should be supplemented by information from the elective courses. It is designed to demonstrate the student's ability to integrate effectively material from several course areas.

The comprehensive examination is normally to be taken during the last semester of the student's residence at the University. With faculty approval, a student who fails the Master's Comprehensive Examination may be reexamined. In the event of failure to pass the examination on the second attempt, the student's candidacy and graduate status terminate.

Core Courses

The following courses are required for the Master of Engineering Administration degree and are to be taken prior to any other course in the program:

EAd 211–12 Engineering Administration (3–3)
EAd 269 Elements of Decision Making and Problem Solving (3)

General Program

Engineering Administration

Study in engineering administration provides the conceptual depth in management practice and knowledge needed by technical and scientific personnel who are confronted with increasing demands and complexities. Technical knowledge is complemented by understanding of theory and practice in management action. Engineering management is a logical development of a technological society. The program is designed to provide engineers with knowledge and proficiency in the administration of engineering and science. It emphasizes use of deliberative, purposive study of general administrative problems and opportunities as well as the study and use of specific knowledge and methods needed to solve administrative problems and to explore opportunities. A program is prescribed for each student in conference with the adviser.

Required Courses
EAd core courses (9)
EAd 299–300 Thesis Research (6) or EAd 297 Problems in Engineering Administration (3) (nonthesis option)
Electives (15–21): Electives are chosen from the Department of Engineering Administration and other departments of the University, but no more than two courses may be chosen from other departments.

Areas of Concentration

Students wishing to pursue a specific area of concentration, as opposed to following the general program in engineering administration, may select one of the following programs:

Administration of Research and Development

The program is designed to prepare students for responsible managerial positions in organizations conducting technological or scientific research and

development and in organizations planning and administering programs of technological or scientific research and development. A program is prescribed for each student in conference with the adviser.

Required Courses
EAd core courses (9)
EAd 207 The Personnel Function for Engineering Administrators (3)
EAd 255 Administration of Research and Development (3)
EAd 299–300 Thesis Research (6) or EAd 297 Problems in Engineering Administration (3) (nonthesis option)
Electives (9–15)

Artificial Intelligence and Human Factors

Individuals concerned with the needs and productivity of users of engineered systems will be interested in this concentration. The educational program is intended to aid students in building either more intelligence or more human factors into such systems by tying together many of the basic topics of the artificial intelligence and human factors fields. A program is prescribed for each student in conference with the adviser.

Required Courses
EAd core courses (9)
EAd 217 Fundamentals of Artificial Intelligence
EAd 270 Expert Systems
EAd 287 Decision Support Systems and Models
EAd 290 Human Factors Engineering
EAd 299–300 Thesis Research (6) or EAd 297 Problems in Engineering Administration (3) (nonthesis option)

Construction Management

Construction management encompasses managerial functions in an organization that plans and executes major construction work. This can take place in the field, in the project office, or in a main office. Due to the inherent complexity of present-day engineering, engineers need to know management as well as basic planning, design, and construction methods. They need to know construction developments, problems of contracts and specifications, techniques of scheduling and control, estimating, labor relations, and industrial or management psychology.

This program prepares the engineer for the task of marshalling personnel, materials, machines, and money as functions of time, cost, weather, and human nature to plan and build structures. A program is prescribed for each student in conference with the adviser.

Required Courses
EAd core courses (9)
EAd 241 Construction Management I (3)
EAd 242 Construction Management II (3)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 299–300 Thesis Research (6) or EAd 297 Problems in Engineering Administration (3) (nonthesis option)
Electives (6–12)

Environmental and Energy Management

This program prepares students for positions in organizations involved with environmental, energy, and related resource management. This includes organizations conducting environmental control and energy conservation and organizations planning and administering programs in energy resource development/utilization and in prevention and control of environmental pollution. A program is prescribed for each student in conference with the adviser.

Required Courses
EAd core courses (9)
EAd 221 Environmental Management (3)
EAd 222 Energy Management (3)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 299–300 Thesis Research (6) or EAd 297 Problems in Engineering Administration (3) (nonthesis option)
Electives (6–12)

Marketing of Technology

As the American economy matures and Americans survey the spectrum of options available to them, it is apparent that scientific and engineering outputs must be sold in worldwide competition both at home and abroad. The trained specialist is becoming more important than ever before in performing the selling function. The objective of this program is to prepare students for responsible positions in marketing technical products and services. A program is prescribed for each student in conference with the adviser.

Required Courses
EAd core courses (9)
EAd 293 Technical Enterprises (3)
EAd 294 Marketing of Technology I (3)
EAd 299–300 Thesis Research (6) or EAd 297 Problems in Engineering Administration (3) (nonthesis option)
EAd 311 Marketing of Technology II (3)
Electives (6–12)

Public Works Management

The public works sector is one of the largest and most diverse fields of public service. It involves planning, design, construction, operation, maintenance, and management of physical systems (infrastructure) essential to economic and social development of communities, regions, and nations. These systems include transportation, water resources, waste disposal, public structures and facilities, airports and seaports, public utilities, and general aspects of broad environmental concerns.

The program in public works management is designed to develop an ability to apply the knowledge pertinent to the field in an effective and professional manner. Additionally it is intended that students develop a sensitivity to the people-related technical problems that confront the public works professional. A program is prescribed for each student in conference with the adviser.

Required Courses
EAd core courses (9)
PAd 231 Personnel Management

PAd 242 Administration of State and Local Governments
EAd 215 Ethical Issues in Engineering Administration
EAd 297 Problems in Engineering Administration or PAd 290 Special Topics in Public Administration
Electives (6) from engineering administration
Electives (6) from public administration and/or civil engineering

Technology and Public Affairs

This program prepares students for responsible positions requiring managerial decision making on matters that involve the impact of technology on public policy and that concern the general interrelationship between modern technology and public affairs. A program is prescribed for each student in conference with the adviser.

Required Courses
EAd core courses (9)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 288 Technology Issue Analysis (3)
EAd 299–300 Thesis Research (6) or EAd 297 Problems in Engineering Administration (3) (nonthesis option)
EAd 386 Advanced Topics in Management (3)
Electives (6–12)

Transportation Management

This program prepares students for responsible positions in the management of transportation systems or in the formulation of transportation policy. A program is prescribed for each student in conference with the adviser.

Required Courses
EAd core courses (9)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 265 Transportation Management I (3)
EAd 266 Transportation Management II (3)
EAd 299–300 Thesis Research (6) or EAd 297 Problems in Engineering Administration (3) (nonthesis option)
Electives (6–12)

Professional Degree Program

The Department of Engineering Administration has established the professional degree program for those students who are interested in pursuing course work beyond the master's degree with emphasis on applied subject material rather than research. The program leads to the degree of Applied Scientist or to the degree of Engineer and has been designed to meet the needs of industry and government for highly prepared personnel in engineering administration.

In the professional degree program, emphasis is on increasing the student's knowledge, understanding, and skill by concentrating on principles and their application. This approach provides the individual with flexibility to adapt successfully to changing circumstances.

Each student's program is planned considering his or her background and needs, consistent with departmental requirements.

Areas of Specialization

The professional degree program provides post-master's degree graduate study in areas in which the department has adequate facilities and resources. Upon departmental approval, the student may select courses in other University departments to meet specific needs or objectives. Courses can, upon departmental approval, be chosen in the following areas:

Administration of Research and Development
Artificial Intelligence and Human Factors
Construction Management
Engineering Administration
Environmental and Energy Management
Marketing of Technology
Public Works Management
Technology and Public Affairs
Transportation Management

A student's program of study will provide concentration in a selected area and include courses from other areas. A program consists of a minimum of 30 semester hours of approved graduate courses beyond a master's degree, 6 of which are devoted to a professional project. Students whose prior study does not include specified prerequisites may be required to take more than the minimum number of semester hours.

Admission

Admission to graduate study toward the professional degree requires appropriate bachelor's and master's degrees from recognized institutions and evidence of capacity for productive study. To study toward the professional degree of Engineer (in Engineering Administration), an applicant must possess a bachelor's degree in engineering; for the professional degree of Applied Scientist (in Engineering Administration), an applicant must possess a bachelor's degree in mathematics or a natural science. In both cases a master's degree in engineering administration or a related field is required. Applicants having equivalent backgrounds of study may be considered. At least a 3.2 average in the master's degree program studies is required.

Those applicants having master's degrees in engineering, natural science, or mathematics may be required to meet the following prerequisites: at least the three core courses (EAd 211–12, 269) and one elective, selected with approval of the student's adviser, with a grade of *B* or better.

Admission to Candidacy

An applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions. No courses taken by the applicant to meet these prerequisite requirements and conditions can be applied toward the professional degree. If course work beyond the prerequisites and conditions is taken in the interval between admission to study and admission to degree candidacy, a maximum of 9 hours of this additional course work can be applied, with the approval of the adviser, toward degree requirements.

Transfer Credit

Up to 6 semester hours of satisfactory study (with grades of *A* or *B*) in a graduate degree program beyond a master's degree will be considered for

transfer toward the professional degree. Previously earned credits must have been earned within five years of admission to candidacy for the professional degree and must be appropriate for the student's professional degree program. The student must, with the approval of his or her adviser, petition the department chairman for such transfer.

Program of Study

Upon admission, the student is assigned a faculty adviser. A program of study is drawn up considering any deficiencies at admission and professional degree requirements. The program of study for each student must be approved by the student's adviser and the department chairman. An area of concentration is selected to prepare the student to undertake the professional project. Other courses are selected either to support work on the planned project or to meet other needs. With prior approval of the adviser, up to 12 semester hours of study may be taken in other departments of instruction if such work is pertinent to the program. These 12 hours include the 6 potential transfer credits.

Professional Project

Each degree candidate must engage in a professional project on which the candidate will submit an acceptable report of an analysis and solution of a real-world problem in engineering administration. The project requires the student to demonstrate the ability to apply newly acquired knowledge to identify a problem, to work through to a solution, and to communicate the results in writing.

When the course work is essentially completed and with the adviser's approval, the candidate will register for EAd 395–96 Seminar: Professional Project (3–3) to receive guidance in the professional project. Before registration the candidate should have identified an area or project to study and prepared a written study proposal, including consideration of the feasibility of the proposed effort. Shortly after registration for work on the project, the candidate must submit a detailed project proposal to the project adviser and to the department chairman for approval. Six semester hours are assigned for work on the professional project.

Scholarship

No student studying for the professional degree may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B* or more than one *F*, study is terminated and further enrollment is prohibited. A student must achieve a final quality-point average of at least 3.1 to receive the degree.

Time Limits

A full-time student in the professional degree program is allowed a maximum of three calendar years, from the date of the student's first registration as a graduate student in prerequisite or graduate courses, to complete all degree requirements. A part-time student in this program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it

encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing.

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the department chairman.

Residence and Continuous Study

All work for the degree must be done while in residence on campus except when special permission is granted by the department chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration and necessitates application for readmission to the professional degree program under whatever conditions and regulations are in effect at that time.

Doctor of Science Degree Program

A program in engineering administration leading to the degree of Doctor of Science provides advanced study and research to enable gifted students to extend their knowledge and to enhance their career opportunities in research or education.

Admission

All applicants must meet the general requirements for admission to doctoral study stated on pages 40–41.

Applicants for doctoral study in engineering administration must have a master's degree, with a record of superior academic achievement (at least 3.40) in engineering administration or a related field. Those applicants having master's degrees in engineering, natural science, or mathematics may be required to meet the following prerequisites: at least the three core courses (EAd 211–12, 269) and one elective, selected with approval of the student's adviser, with a grade of *B* or better.

An applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions and after completing *all* course and language requirements and qualifying examinations (see pages 40–42). No courses taken by the student to meet prerequisite requirements and conditions can be applied toward the doctoral degree. If course work beyond the prerequisites and conditions is taken in the interval between admission to study and admission to the degree program, a maximum of 9 hours of this additional course work can be applied, with the approval of the adviser, toward degree requirements.

Language Requirement

A doctoral student should maintain a broad outlook in pursuing his or her study and, therefore, must have the capability of reading appropriate literature published in a foreign language. Accordingly, a reading knowledge of one foreign language must be demonstrated before the qualifying examination may be taken. The student must obtain the adviser's approval of the language selected.

For doctoral students whose native language is not English, English will be designated as the language to satisfy the student's foreign language

requirement. Preliminary to taking the doctoral qualifying examination, the student must pass an examination in English administered for doctoral candidates in the Department of Engineering Administration by the English for International Students office.

Transfer Credit

Up to 6 semester hours of satisfactory study, with grades of *A* or *B*, in a graduate degree program beyond a master's degree will be considered for transfer toward the doctoral degree. They must have been earned within the five years preceding admission for the doctoral degree and must be appropriate to the student's doctoral degree program. The student must, with the approval of his or her adviser, petition the department chairman for such transfer.

Programs of Study

In addition to the major field of engineering administration, a minor area of concentration is normally required, which may be chosen from the areas administered by this department or from appropriate areas available in other departments of the University. The general requirements for doctoral study are stated on pages 40–44.

Upon admission, the student is assigned to a faculty adviser. A program of study is drawn up considering any deficiencies at admission, preparation for the qualifying examination, and doctoral degree requirements. An area of study is selected to prepare the student to undertake the dissertation research. Other courses are selected either to support work on the dissertation or to meet other needs. The program of study for each student must be approved by the student's adviser and the department chairman.

Dissertation

Each degree candidate is required to prepare and submit a dissertation according to the requirements described on pages 42–44. Once the qualifying examinations are satisfactorily completed, the candidate identifies an area or project to study and prepares a research proposal that includes consideration of the merit of the proposed research and the adequacy of his or her preparation to conduct it successfully. The detailed project proposal is submitted for approval to a selected faculty member, who will serve as the student's director of research, and two additional members of the department who collectively will constitute the proposal committee. Work on the research project is conducted as part of the dissertation course EAd 399. The candidate must maintain registration in EAd 399 for 24 credit hours. After the 24 credit hours are completed, the candidate must be enrolled in continuous research until satisfactory completion of the dissertation.

Scholarship

A student studying for the doctoral degree must achieve a cumulative quality-point average of at least 3.4 to receive the degree. No such student may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B* or more than one *F*, study is terminated and further enrollment is prohibited.

Time Limits

A full-time student in the doctoral degree program is allowed a maximum of five calendar years to complete all degree requirements, from the date of the student's first registration as a graduate student in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of seven calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing (see page 43–44).

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the department chairman.

Residence and Continuous Study

All work for the degree must be done while in residence on campus except when special permission is granted by the department chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration and necessitates application for readmission to the doctoral degree program under whatever conditions and regulations are in effect at that time.

Graduate Study in Systems Analysis and Management

Master of Science Degree Program

The Master of Science degree is offered to students specializing in systems analysis and management. The program is administered by the Department of Engineering Administration with the cooperation of the Department of Operations Research. Only a nonthesis program is offered.

The systems viewpoint has been productive in the design of organizations and in detecting, analyzing, and solving organizational problems. It emphasizes the interconnectedness of elements and activities of a system, including personnel considerations. An increasing need exists for individuals who can apply the systems approach to organizational systems.

Analysis, synthesis, and management of organizations from the systems standpoint require a blend of studies from the areas of management and operations research. Study of management and operations research provides insights into organizations and their personnel, understanding of the viewpoints and techniques of managers with whom the systems analyst or manager must interact, mathematical and statistical tools for the analysis and synthesis of systems, and scientifically based methods for detection, analysis, and solution of system problems. Consequently, a systems analyst/manager utilizes a mathematical or nonmathematical formulation of information as appropriate to the situation. The increasing application of computers for management makes understanding of their capabilities essential.

Admission and Prerequisites

In addition to the general requirements for admission to graduate study (see pages 31–33), applicants must meet the following requirements: (1) The applicant must have basic knowledge of probability and statistics, principles of management, engineering economic analysis, and computers. The require-

ments can be met by satisfactory completion of the following undergraduate courses or approved equivalents: ApSc 115, 116; EAd 150, 160; and CSci 100. (Students may not earn graduate credit for these courses.) (2) The applicant may be required to complete other undergraduate prerequisite courses prescribed as a condition for admission. The student is required to earn the grade of *C* or better (unless upon admission the requirement is stipulated to be a grade of *B* or better) in each undergraduate prerequisite course. If this scholarship requirement is not met, the student is barred from further enrollment. Credit for prerequisite courses is not applicable toward the degree of Master of Science in Systems Analysis and Management, and unless approved by the department chairman, all prerequisite courses must be completed prior to taking graduate courses in this degree program.

Master's Comprehensive Examination

A student must pass a Master's Comprehensive Examination. The examination is scheduled three times a year. On the prescribed form and prior to the deadline, students must notify the department of their intent to take the examination. Thereafter, requests to withdraw must be submitted in writing in advance of the examination date. Unexcused absence constitutes a forfeiture and is regarded as a failure of the examination. The examination lasts four hours. The student must demonstrate the ability to apply what has been learned while pursuing a formal graduate program. The examination is drawn from the prerequisite courses and core courses; however, answers should be supplemented by information from the elective courses. It is designed to demonstrate the student's ability to integrate effectively material from several course areas.

The comprehensive examination is normally to be taken during the last semester of the student's residence at the University. With faculty approval, a student who fails the Master's Comprehensive Examination may be reexamined. In the event of failure to pass the examination on the second attempt, the student's candidacy and graduate status terminate.

Required Courses

Course descriptions for the systems analysis and management degrees are found in the respective departments as indicated by the departmental abbreviation (e.g., EAd or OR). Only a nonthesis program is offered.

EAd 211–12 Engineering Administration (3–3)
EAd 269 Elements of Decision Making and Problem Solving (3)
EAd 281 Systems Analysis and Management I (3)
EAd 282 Systems Analysis and Management II (3)
EAd 287 Decision Support Systems and Models (3)
OR 201 Survey of Operations Research: Deterministic Models (3)
OR 202 Survey of Operations Research: Stochastic Models (3)

Elective Courses

Two courses are selected from course offerings of the Department of Operations Research, normally from among the following.

OR 232 Applications of Linear and Nonlinear Optimization Theory (3)
OR 251 Linear Programming (3)

OR 262 Decision Analysis (3)
OR 271 Forecasting Techniques (3)
OR 277 Queuing Theory (3)
OR 279 Inventory Control (3)

One project course is selected from the following, according to the nature of the project chosen at the end of the period of study.

EAd 297 Problems in Engineering Administration (3)
OR 291 Problems in Operations Research (3)

Professional Degree Program

The Department of Engineering Administration has established the professional degree program for those students who are interested in pursuing course work beyond the master's degree with emphasis on applied subject material rather than research. The program leads to the degree of Applied Scientist or Engineer and has been designed to meet the needs of industry and government for highly prepared personnel in systems analysis and management.

In the professional degree program, emphasis is on increasing the student's knowledge, understanding, and skill by concentrating on principles and their application. This approach provides the individual with flexibility to adapt successfully to changing circumstances.

Each student's program is planned considering the student's background and needs consistent with departmental requirements.

Area of Specialization

The professional degree program in systems analysis and management provides post-master's degree graduate study in the departments of Engineering Administration and Operations Research. With the adviser's approval, the student may select courses in other University departments to meet specific needs or objectives.

A student's program of study will provide concentration in systems analysis and management and will include courses from other areas. A program consists of a minimum of 30 semester hours of approved graduate courses beyond a master's degree, 6 of which are devoted to a professional project. Students whose prior study does not include specified prerequisites may be required to take more than the minimum number of semester hours

Admission

Admission to study toward the professional degree requires appropriate bachelor's and master's degrees from recognized institutions and evidence of capacity for productive study. To study toward the professional degree of Engineer (in systems analysis and management), an applicant must possess a master's degree in systems analysis and management, or in an equivalent field, and a bachelor's degree in engineering. For the professional degree of Applied Scientist (systems analysis and management), an applicant must possess an appropriate bachelor's degree and a master's degree in systems analysis and management or a related field. Applicants having equivalent backgrounds of study may be considered. At least a 3.2 average in master's degree program studies is required.

Those applicants having master's degrees in fields other than systems analysis and management, or equivalent, must have basic knowledge of

probability and statistics, principles of management, engineering economic analysis, and computers. These requirements may be met by satisfactory completion of the following undergraduate courses or approved equivalents: ApSc 115, 116; EAd 150, 160; and CSci 100. (Students may not earn graduate credit for these courses.) The applicant may be required to complete other undergraduate prerequisite courses prescribed as a condition for admission. In addition, several graduate prerequisite courses may be required: EAd 211–12, 269, 281, and OR 201–202. Neither undergraduate nor graduate prerequisite courses may be applied toward the professional degree.

Admission to Candidacy

An applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions. If course work beyond the prerequisites and conditions is taken in the interval between admission to study and admission to degree candidacy, a maximum of 9 semester hours of this additional course work can be applied, with the approval of the adviser, toward degree requirements.

Transfer Credit

Up to 6 semester hours of satisfactory study (with grades of *A* or *B*) in a graduate program beyond a master's degree will be considered for transfer toward the professional degree. Previously earned credits must have been earned within five years of admission to candidacy for the professional degree and must be appropriate for the student's professional degree program. The student must, with the approval of the adviser, petition the department chairman for such transfer.

Program of Study

Upon admission, the student is assigned a faculty adviser. A program of study is drawn up considering any deficiencies at admission and professional degree requirements. The program of study for each student must be approved by the student's adviser and the department chairman. An area of concentration is selected to prepare the student to undertake the professional project. Other courses are selected either to support work on the planned project or to meet other needs. With prior approval of the adviser, up to 12 semester hours of study may be taken in other departments of instruction if such work is pertinent to the program. These 12 hours include the 6 potential transfer credits.

Professional Project

Each degree candidate must engage in a professional project on which he or she will submit an acceptable report of an analysis and solution of a real-world problem in systems analysis and management. The project requires the student to demonstrate the ability to apply newly acquired knowledge to identify a problem, to work through to a solution, and to communicate the results in writing.

When the course work is essentially completed and with the adviser's approval, the candidate will register for EAd 395–96 Seminar: Professional

Project (3–3) to receive guidance in the professional project. Before registration the candidate should have identified an area or project to study and prepared a written study proposal, including consideration of the feasibility of the proposed effort. Shortly after registration for work on the project, the candidate must submit a detailed project proposal to the project adviser and to the department chairman for approval. Six semester hours are assigned for work on the professional project.

Scholarship

No student studying for the professional degree may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B* or more than one *F*, study is terminated and further enrollment is prohibited. A student must achieve a final quality-point average of at least 3.1 to receive the degree.

Time Limits

A full-time student in the professional degree program is allowed a maximum of three calendar years, from the date of the student's first registration as a graduate student in prerequisite or graduate courses, to complete all degree requirements. A part-time student in this program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing.

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the department chairman.

Residence and Continuous Study

All work for the degree must be done while in residence on campus except when special permission is granted by the department chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration and necessitates application for readmission to the professional degree program under whatever conditions and regulations are in effect at that time.

Doctor of Science Degree Program

A program in systems analysis and management leading to the degree of Doctor of Science provides advanced study and research to enable gifted students to extend their knowledge and to enhance their career opportunities in research or education.

Admission

All applicants must meet the general requirements for admission to doctoral study stated on pages 40–41. Applicants for Doctor of Science study in systems analysis and management must have appropriate bachelor's and master's degrees from recognized institutions and evidence of capacity for productive study and research. They must have a master's degree with a record of superior academic achievement (at least 3.4) in systems analysis and management or an equivalent field. Applicants with other master's degrees must have knowl-

edge of basic probability and statistics, principles of management, engineering economic analysis, and computers. The requirements may be met by satisfactory completion of the following undergraduate courses or approved equivalents: ApSc 115, 116; EAd 150, 160; and CSci 100. The applicant may be required to complete other prerequisite courses prescribed as a condition for admission. In addition, several graduate prerequisite courses may be required: EAd 211–12, 269, 281, and OR 201–202. Credit for undergraduate and graduate prerequisite courses may not be applied toward the Doctor of Science degree.

An applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions and after completing *all* course and language requirements and qualifying examinations (see pages 40–42). No courses taken by the student to meet prerequisite requirements and conditions can be applied toward the doctoral degree. If course work beyond the prerequisites and conditions is taken in the interval between admission to study and admission to the degree program, a maximum of 9 hours of this additional course work can be applied, with the approval of the adviser, toward degree requirements.

Language Requirement

A doctoral student should maintain a broad outlook in pursuing his or her study and, therefore, must have the capability of reading appropriate literature published in a foreign language. Accordingly, a reading knowledge of one foreign language must be demonstrated before the qualifying examination may be taken. The student must obtain the adviser's approval of the language selected.

For doctoral students whose native language is not English, English will be designated as the language to satisfy the student's foreign language requirement. Preliminary to taking the doctoral qualifying examination, the student must pass an examination in English administered for doctoral candidates in the Department of Engineering Administration by the English for International Students office.

Transfer Credit

Up to 6 semester hours of satisfactory study, with grades of *A* or *B*, in a graduate degree program beyond a master's degree will be considered for transfer toward the doctoral degree. They must have been earned within the five years preceding admission to the doctoral program and must be appropriate to satisfy the student's doctoral degree program. The student must, with the approval of the adviser, petition the department chairman for such transfer.

Program of Study

In addition to the major field of systems analysis and management, a minor area of concentration is required. It may be chosen from the areas administered by this department, the Department of Operations Research, or from appropriate areas in other departments of the University. The general requirements for doctoral study are stated on pages 40–44.

Upon admission, the student is assigned a faculty adviser. A program of study is drawn up considering any deficiencies at admission, preparation for

the qualifying examination, and doctoral degree requirements. An area of study is selected to prepare the student to undertake dissertation research. Other courses are selected either to support work on the dissertation or to meet other needs. The program of each student must be approved by his or her adviser and the department chairman.

Dissertation

Each degree candidate is required to prepare and submit a dissertation according to the requirements described on pages 42–44. Once the qualifying examinations are satisfactorily completed, the candidate identifies an area or project to study and prepares a research proposal that includes consideration of the merit of the proposed research and the adequacy of preparation to conduct it successfully. The detailed project proposal is submitted for approval to a selected faculty member, who will serve as the student's director of research, and two additional members of the department who collectively will constitute the proposal committee. Work on the research project is conducted as part of the dissertation course EAd 399. The candidate must maintain registration in EAd 399 for 24 credit hours. After the 24 credit hours are completed, the candidate must be enrolled in continuous research until satisfactory completion of the dissertation.

Scholarship

A student studying for the doctoral degree must achieve a cumulative quality-point average of at least 3.4 to receive the degree. No such student may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B* or more than one *F*, study is terminated and further enrollment is prohibited.

Time Limits

A full-time student in the doctoral degree program is allowed a maximum of five calendar years to complete all degree requirements, from the date of the student's first registration as a graduate student in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of seven calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing (see pages 43–44).

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the department chairman.

Residence and Continuous Study

All work for the degree must be done while in residence on campus except when special permission is granted by the department chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration and necessitates application for readmission to the doctoral degree program under whatever conditions and regulations are in effect at that time.

Graduate Study in Information Management

Master of Science Degree Program

The Master of Science degree is offered to students specializing in information management. The program is administered by the Department of Engineering Administration with the cooperation of the Department of Electrical Engineering and Computer Science.

More and more, information is being recognized as a major resource of modern organizations. The design and operation of systems for the efficient management of information to serve the needs of organizational managers require knowledge of the process and techniques of management and of the technology of computers and data processing. There is a growing need for individuals who are able to apply the power of computer science to the process of management.

This program offers a blend of studies from the areas of engineering administration, management science, and computer science. It provides insight into the problems of management, understanding of the viewpoints and techniques of managers, and an appreciation of the technology of data processing and data communications. Two areas of specialization are offered: software engineering and applications of information systems.

Admission and Prerequisites

Admission to graduate study toward a master's degree requires a bachelor's degree from a recognized institution and evidence of capacity for productive work at the graduate level. In addition, applicants for the program leading to the degree of Master of Science in information management must meet the following requirements: (1) A minimum of two years of experience in data processing, data communications, or related areas. (2) Basic knowledge of calculus, probability and statistics, principles of management, and engineering economic analysis. This requirement can be met by satisfactory completion of the following undergraduate courses or approved equivalents: Math 51 and 52 Mathematics for the Social and Management Sciences I and II, EAd 150 Introduction to Engineering Administration, EAd 160 Introduction to Engineering Economic Analysis, EAd 170 Basic Quantitative Methods for Engineering Administration. A student is required to earn the grade of *C* or better (unless the requirement is stipulated to be a grade of *B* or better upon admission) in each undergraduate prerequisite course. If this scholarship requirement is not met, the student is barred from further enrollment. Credit for prerequisite courses is not applicable toward the degree of Master of Science. Unless approved by the department chairman, all prerequisite courses must be completed prior to taking graduate courses in this degree program.

Master's Comprehensive Examination

A student must pass a Master's Comprehensive Examination. The examination is scheduled three times a year. On the prescribed form and prior to the deadline, students must notify the department of their intent to take the

examination. Thereafter, requests to withdraw must be submitted in writing in advance of the examination date. Unexcused absence constitutes a forfeiture and is regarded as a failure of the examination. The examination lasts four hours. The student must demonstrate the ability to apply what has been learned while pursuing a formal graduate program. The examination is drawn from the prerequisite courses and core courses; however, answers should be supplemented by information from the elective courses. It is designed to demonstrate the student's ability to integrate effectively material from several course areas.

The comprehensive examination is normally to be taken during the last semester of the student's residence at the University. With faculty approval, a student who fails the Master's Comprehensive Examination may be reexamined. In the event of failure to pass the examination on the second attempt, the student's candidacy and graduate status terminate.

Required Courses

Only a nonthesis program is offered.

EAd 211 Engineering Administration I (3)
EAd 212 Engineering Administration II (3)
EAd 251 Management of Information Resources (3)
EAd 269 Elements of Decision Making and Problem Solving (3)
EAd 297 Problems in Engineering Administration (3)

The following courses are required, depending on the area of student specialization.

Software Engineering

*CSci 100 Introduction to Computer Science (3)
†‡CSci 157 Assembly Language Programming of Large System Computers (3)
or
†‡CSci 147 Assembly Language Programming of Microcomputers (3)
†‡CSci 158 Algorithmic Methods (3)
‡CSci 159 Programming and Data Structures (3)
CSci 227 Management Information Systems and Database Management (3)

Applications of Information Systems

EAd 254 Computer Systems in Information Management (3)
EAd 256 Survey of Information Systems (3)
EAd 295 Management of Technical Information (3)
EAd 321 Management Information Systems and Networks (3)

Sufficient additional courses are selected, with permission of the faculty adviser, to total 33 credit hours.

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* Prerequisite course, not to be counted for graduate credit.
† Students having training or experience in assembly language programming may take CSci 201 in place of CSci 157 (or CSci 147) and CSci 158.
‡ May be taken for graduate credit.

Professional Degree Program

The Department of Engineering Administration has established the professional degree program for those students who are interested in pursuing course work beyond the master's degree with emphasis on applied subject material rather than research. The program leads to the degree of Applied Scientist or Engineer and has been designed to meet the needs of industry and government for highly prepared personnel in information management.

In the professional degree program, emphasis is on increasing the student's knowledge, understanding, and skill by concentrating on principles and their application. This approach provides the individual with the flexibility to adapt successfully to changing circumstances. Each student's program is planned considering his or her background needs and consistent with departmental requirements.

The professional degree program in information management provides post-master's graduate study in the departments of Engineering Administration and Electrical Engineering and Computer Science. With the approval of his or her adviser, the student may select courses in other University departments to meet specific needs or objectives.

A student's program of study will provide concentration in information management and include courses from other areas. A program consists of a minimum of 30 semester hours of approved graduate courses beyond a master's degree, 6 of which are devoted to a professional project. Students whose prior study does not include specified prerequisites may be required to take more than the minimum number of semester hours.

Admission

Admission to study toward the professional degree requires appropriate bachelor's and master's degrees from recognized institutions and evidence of capacity for productive study. To study toward the professional degree of Applied Scientist (in information management), an applicant must possess a master's degree in computer science, information management, or engineering administration. For the professional degree of Engineer, an applicant must possess a bachelor's degree in engineering. Applicants with equivalent backgrounds of study may be considered. At least a 3.2 average in master's degree program studies is required. Those applicants with master's degrees in equivalent fields must have basic knowledge of calculus, probability and statistics, principles of management, engineering economic analysis, and computer science. These requirements may be met by satisfactory completion of the following undergraduate courses or approved equivalents: Math 51 and 52; EAd 150, 160, 170; and CSci 100. (Students may not earn graduate credit for these courses.) The applicant may be required to complete the following graduate prerequisite courses prescribed as a condition for admission: EAd 211–12, 254, and 269.

Admission to Candidacy

An applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions. If course work beyond the prerequisites and conditions is taken in the interval between admission to study and admission to degree candidacy, a maximum of 9 semester hours of

this additional course work can be applied, with the approval of the adviser, toward degree requirements.

Transfer Credit

Up to 6 semester hours of satisfactory study (with grades of *A* or *B*) in a graduate program beyond a master's degree will be considered for transfer toward the professional degree. Previously earned credits must have been earned within five years of admission to candidacy for the professional degree and must be appropriate for the student's program. Transfer credits may not be granted for courses applied toward meeting the requirements of any degrees previously awarded. The student must, with the approval of his or her adviser, petition the department chairman for such transfer.

Program of Study

Upon admission, the student is assigned a faculty adviser. A program of study is drawn up considering any deficiencies at admission and professional degree requirements. The program of study for each student must be approved by the student's adviser and the department chairman. An area of concentration should be selected to prepare the student to undertake the professional project, and courses should be selected to support work on the planned project. With prior approval of the adviser, up to 12 semester hours of study may be taken in other departments of instruction if such work is pertinent to the program. These 12 hours include the 6 potential transfer credits.

Professional Project

Each degree candidate must engage in a professional project on which he or she will submit an acceptable report of an analysis and solution of a real-world problem in information management. The project requires the student to demonstrate the ability to apply newly acquired knowledge to identify a problem, to work through to a solution, and to communicate the results in writing.

When the course work is essentially completed and with the adviser's approval, the candidate will register for EAd 395–96 Seminar: Professional Project (3–3) to receive guidance in the professional project. Before registration for this seminar, the candidate should have tentatively identified a project to study and have prepared a study proposal, including consideration of the feasibility of the proposed effort. Shortly after registration for work on the project, the candidate must submit a detailed project proposal to the project adviser and to the department chairman for approval. Six semester hours are assigned for work on the professional project. No grade is assigned for these hours until completion of the project report, which will be judged as acceptable or unacceptable. Approval of two regular faculty members, one of whom may be the project adviser, is required for acceptance of the project final report, which will result in a grade of Credit for the course semester hours.

Scholarship

No student studying for the professional degree may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B* or more than one *F*, study is terminated and further enrollment is prohibited. A student must achieve a final quality-point average of at least 3.1 to receive the degree.

Time Limits

A full-time student in the professional degree program is allowed a maximum of three calendar years, from the date of the student's first registration as a graduate student in prerequisite or graduate courses, to complete all degree requirements. A part-time student in this program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing.

Doctor of Science Degree Program

A program in information management leading to the degree of Doctor of Science provides advanced study and research to enable gifted students to extend their knowledge and to enhance their career opportunities in research or education.

Admission

All applicants must meet the general requirements for admission to doctoral study stated on pages 40–41.

Applicants for the Doctor of Science degree in information management must have appropriate bachelor's and master's degrees from recognized institutions and evidence of capacity for productive study and research. They must have a master's degree with a record of superior academic achievement (at least 3.4) in computer science, information management, engineering administration (information management area of concentration), or an equivalent field. Applicants with master's degrees in equivalent fields must have knowledge of calculus, basic probability and statistics, principles of management, engineering economic analysis, and computers. The requirements may be met by satisfactory completion of the following undergraduate courses or approved equivalents: Math 51 and 52; EAd 150, 160, 170; and CSci 100. The applicant may be required to complete other prerequisite courses prescribed as a condition for admission. In addition, several graduate prerequisite courses may be required: EAd 211–12, 254, and 269. Credit for undergraduate and graduate prerequisite courses may not be applied toward the Doctor of Science degree.

An applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions and after completing all course and language requirements and qualifying examinations (see pages 40–42). No courses taken by the student to meet prerequisite requirements and conditions can be applied toward the doctoral degree. If course work beyond the prerequisites and conditions is taken in the interval between admission to study and admission to the degree program, a maximum of 9 semester hours of this additional course work can be applied, with the approval of the adviser, toward degree requirements.

Language Requirement

A doctoral student should maintain a broad outlook in pursuing his or her study and, therefore, must have the capability of reading appropriate literature published in a foreign language. Accordingly, a reading knowledge of one

foreign language must be demonstrated before the qualifying examination may be taken. The student must obtain the adviser's approval of the language selected.

For doctoral students whose native language is not English, English will be designated as the language to satisfy the student's foreign language requirement. Preliminary to taking the doctoral qualifying examination, the student must pass an examination in English administered for doctoral candidates in the Department of Engineering Administration by the English for International Students office.

Transfer Credit

Up to 6 semester hours of satisfactory study, with grades of *A* or *B*, in a graduate degree program beyond a master's degree will be considered for transfer toward the doctoral degree. They must have been earned within the five years preceding admission for the doctoral degree and must be appropriate to the student's program for the doctoral degree. The student must, with the approval of his or her adviser, petition the department chairman for such transfer.

Program of Study

An area of study is selected to prepare the student to undertake the dissertation research. Other courses are selected either to support work on the dissertation or to meet other needs. The program of study for each student must be approved by the student's adviser and the department chairman.

In addition to the major field of information management, a minor area of concentration is required. It may be chosen from the areas administered by the Engineering Administration Department and the Department of Electrical Engineering and Computer Science or from appropriate areas in other departments of the University. The general requirements for doctoral study are stated on pages 40–44.

Upon admission, the student is assigned a faculty adviser. A program of study is drawn up considering any deficiencies at admission, preparation for the qualifying examination, and doctoral degree requirements. An area of study is selected to prepare the student to undertake the dissertation research, and courses are selected either to support work on the dissertation or to meet other needs. The program of each student must be approved by the student's adviser and the department chairman.

Dissertation

Each degree candidate is required to prepare and submit a dissertation according to the requirements described on pages 42–44. Once the qualifying examinations are satisfactorily completed, the candidate identifies an area or project to study and prepares a research proposal that includes consideration of the merit of the proposed research and the adequacy of his or her preparation to conduct it successfully. The detailed project proposal is submitted for approval to a selected faculty member, who will serve as the student's director of research, and two additional members of the department who collectively will constitute the proposal committee. Work on the research project is conducted as part of the dissertation course EAd 399. The candidate must maintain registration in EAd 399 for 24 credit hours. After the 24 credit hours

are completed, the candidate must be enrolled in continuous research until satisfactory completion of the dissertation.

Scholarship

A student studying for the doctoral degree must achieve a cumulative quality-point average of at least 3.4 to receive the degree. No such student may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B* or more than one *F*, study is terminated and further enrollment is prohibited.

Time Limits

A full-time student in the doctoral degree program is allowed a maximum of five calendar years to complete all degree requirements, from the date of the student's first registration as a graduate student in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of seven calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing (see page 41).

Residence and Continuous Study

All work for the degree must be done while in residence on campus except when special permission is granted by the department chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration and necessitates application for readmission to the doctoral degree program under whatever conditions and regulations are in effect at that time.

Decision Support System Laboratory

A computer laboratory is provided for the primary use of Engineering Administration and Operations Research students. This laboratory is intended to give hands-on experience in the use of computers as a management tool. To this end the focus of the laboratory is on the use of microcomputers and user-friendly management software programs. When additional computing power is needed, however, the microcomputers can be used as reactive terminals with minicomputers in the School of Engineering and Applied Science and with the University's mainframe computer processing unit. The laboratory is also used for research to further develop decision support systems for management and to explore computer-aided teaching in management education.

Engineering Administration Undergraduate Courses

150 Introduction to Engineering Administration (3)
The interrelationships of engineering, science, and management; conceptual foundations for interaction of human factors in individuals, groups, and the social environment of engineering activities. Familiarization with typical activities of engineering managers and with factors bearing on the motiva-

tion of engineers and on engineers as managers. Social and organizational factors relevant to the management of engineers. This course is preliminary to study of the complete management process in EAd 211–12. (Fall, Spring, Summer)

160 **Introduction to Engineering Economic Analysis** (3)
Economic decisions, equivalence, mathematics of finance, present worth, annual cost or profit, internal rate of return, benefit/cost ratio, incremental analysis, multiple alternatives, economic decisions under risk, inflation, depreciation methods, balance sheets, profit and loss statements, the accountant's view, and before- and after-tax analysis. (Fall, Spring, Summer)

170 **Basic Quantitative Methods for Engineering Administration** (3)
An introductory treatment of quantitative tools and techniques important in engineering administration. Concepts of probability, statistics, and operations research. (Fall, Spring, Summer)

Engineering Administration Graduate Courses

204 **Administration of Engineering Contracts** (3)
Study of the total contracting process, including initial budget preparation and justification, actions leading to the execution of a contract, and administration of the contract to completion; considered from the viewpoints of the industrial and government buyer and the seller of technical materials and services. (Fall and Spring)

207 **The Personnel Function for Engineering Administrators** (3)
Principles of managing human talent, the most vital resource in engineering or research; emphasis on principles, theory, and practical considerations of the personnel function for engineering managers, with practical applications in an engineering administration environment. (Fall)

210 **Engineering Law** (3)
Legal principles and procedures of interest to engineers. The American legal system, contracts and specifications, liability of professional engineers, product liability, agency relationships, patent and proprietary rights, special problems in research and development contracts. (Fall and Spring)

211–12 **Engineering Administration** (3–3)
Comprehensive and systematic study of the administrative process; industrial, scientific, and engineering environments. Planning: objectives, prediction, policies, and characteristics of plans. Organizing: theory of organization, structure, authority, specialization, delegation, staff, and committees. Directing: leadership, managing human and material resources. Controlling: setting standards, evaluating performance, using system feedback data for correction and improvement. Prerequisite: EAd 150, 160, or equivalent. (Fall, Spring, Summer)

215 **Ethical Issues in Engineering Administration** (3)
Moral philosophy from which ethical considerations are derived; ethical issues and exemplary problems encountered in the administration of engineering and allied areas of human endeavor. Use of case study method to enhance student's ability to recognize ethical aspects of problem situations and to think analytically and synthetically about such aspects. (Spring)

217 **Fundamentals of Artificial Intelligence** (3)
History of AI, knowledge representation, search and control techniques, natural language processing, computer vision, computer speech, robotics, expert systems, evidential reasoning, AI machines, and features of the LISP and PROLOG languages. Hands-on experience with LISP, a robot arm, a natural language system, and an intelligent data base interfacer. (Spring)

221 **Environmental Management** (3)
The spectrum of technical, economic, political, administrative, and social forces influencing the quality of our environment and the use of our resources. Review of governmental and industrial programs to combat pollution of the air, land, and water. Review of existing and pending legislation involving environmental and related energy matters; theoretical aspects of specific management problems; tools for assessing environmental impact; institutional designs; procedures for promoting public participation. (Fall)

222 **Energy Management** (3)
Designed for those interested in management of energy supply and demand, including petroleum, natural gas, coal, nuclear, conservation, and unconventional forms. Topics include energy legislation; theoretical aspects of pricing and scarcity doctrine; instruments for energy policy; hard, soft, and balanced energy paths; social/legal/institutional barriers to new technologies in extraction, processing, and utilization. Attention is given to combating scarcity, using methods that have the least cost and environmental impact. (Spring)

231 **Program Management** (3)
Programs and projects are widely used in industry and government to facilitate the management of technical undertakings. Management science, the systems approach, and traditional managerial concepts are applied to a variety of typical cases. (Spring)

241 **Construction Management I** (3)
Types of construction procurement; aspects of contracts and specifications important to project management; subcontracting; project income; insurance; bonds; mechanics' liens. (Fall)

242 **Construction Management II** (3)
Administration of construction projects: planning, scheduling, control, resource allocation, and least cost expediting (CPM and PERT techniques). Labor relations; project safety (OSHA). (Spring)

243 **Construction Management III** (3)
Application of quantitative models to construction management problems based on the use of microcomputers. Decision and risk analysis; applied probability concepts; bidding theory and practice; simulation of the construction process; queuing models; dynamic programming. Formulation and solution of quantitative models through the use of real world case studies. Integrated use of the microcomputer to include data base creation/management and spreadsheet programs. (Fall)

251 **Management of Information Resources** (3)
Introduction to analysis, design, and implementation of on-line management information systems, including feasibility studies, requirements analysis, specifications, hardware and software considerations, performance evaluation, implementation plans, and postmortem considerations. Elements of information processing technology, including data transmission and computer networking. Consideration of time sharing, facilities management, standalone computers, service bureaus, centralization vs. decentralization, with emphasis on the use of micro- and minicomputers in distributed processing. (Fall and Spring)

253 **Production Management** (3)
Recognition and consideration of production operations in the context of an integrated company strategy. Process analysis, trade-off analysis, capacity management and planning, and technology planning. (Spring)

254 Computer Systems in Information Management (3)
(Formerly Automatic Data Processing Systems)
Use of computers in information systems with emphasis on accounting applications. Includes introduction to micro-computer analytical tools, logic of computers, hardware and software concepts, and data communications fundamentals. Laboratory required. (Fall, Spring, Summer)

255 Administration of Research and Development (3)
The study of technological innovation as a vital part of the organizational adaptation process; the role of the technical manager in using organization, planning, and motivation to accomplish research and development objectives. (Fall)

256 Survey of Information Systems (3)
The information industry; main-frames, semi-conductors, telecommunications, office automation systems. Information systems for engineering: computer architecture, concept of computer language, languages used in engineering information systems, the data base, data communications systems, computer communication networks. Prerequisite: EAd 254 or permission of the instructor. Laboratory required. (Fall and Spring)

261 Economic Analysis in Engineering Planning (3)
Case studies in engineering economic planning, advanced problems in engineering economy. Prerequisite: EAd 160 or an equivalent course in engineering economy; permission of instructor. (Fall and Spring)

262 Finance for Engineers (3)
Exposition of the financial concepts encountered in engineering situations: financial statements, costing, inventories, profitability analysis, depreciation, credit, leasing, and capital formation. (Fall)

265 Transportation Management I (3)
Integration of social, technical, economic, and political considerations that shape transportation systems and their management. Focus on modal histories and relative advantages. (Fall)

266 Transportation Management II (3)
Intergovernmental relations, regulatory process, property acquisition, cost recovery, condemnation, labor standards, environmental laws applicable to transportation, citizen participation, and land use regulations. Current topics in management and the legal process in both government and private sectors. (Spring)

269 Elements of Decision Making and Problem Solving (3)
Concepts and quantitative techniques of scientific method in solving administrative problems. Role of decision criteria and subjective factors. Bayesian analysis. Model building, testing, solving. Control—general, control charts, sampling inspection. Experimentation to differentiate variables, build models—statistical tests, analysis of variance, linear regression and correlation. Application to nonmathematical formulations. Prerequisite: ApSc 115 and OR 201; or EAd 170. (Fall, Spring, Summer)

270 Expert Systems (3)
History of expert systems, theoretical principles of evidential reasoning (e.g., forward and backward chaining), alternative knowledge representation systems (rule-based, frame-based, etc.), nondeterministic approaches, overview of languages for language system design, deep knowledge systems, review of expert system "construction kits," extensive hands-on with existing expert systems, steps of the knowledge engineering procedure. (Spring)

281 Systems Analysis and Management I (3)
The systems or holistic approach as a methodology for making decisions and allocating resources. Analysis by means of objectives, alternatives, models, criteria, and feedback. Prerequisite: EAd 269. (Fall)

282 Systems Analysis and Management II (3)
Extension and elaboration of systems analysis techniques, including their application to industry, input–output structures, human behavior in organi-

zations, and military situations. Prerequisite: EAd 281 or permission of instructor. (Spring)

283 **Systems Engineering** (3)
Concept of system structure and organization. Linear and nonlinear systems analysis; dynamics and stability of systems. Introduction to optimization methods and systems simulation techniques. (Fall, odd years)

285 **Seminar: Administrative Problems** (3)
Individual analysis of complex administrative problems, with group evaluation and discussion. Prerequisite: 18 semester hours of graduate credit. (Fall and Spring)

287 **Decision Support Systems and Models** (3)
Intended to expose managers to decision tools and the modeling process and modelers system designers to the decision maker's perspective. Impact of human behavioral, managerial, and situational factors on choice of computer-based technique; simplified models. Review of theory, languages, and methods in system modeling and artificial intelligence. Management of the modeling process, including predesign, software costing (make or buy), development, verification, validation, and implementation cycles. Case studies. (Fall)

288 **Technology Issue Analysis** (3)
A seminar for technical managers who need the contextual background and intellectual basis for addressing technology issues in the public and private sectors. Technology impact assessment, technology forecasting, technology innovation, and the principles and practices of technology transfer as elements of a systematic approach to informed choice and sound technology decisions. (Fall)

290 **Human Factors Engineering** (3)
Purpose; basic approach to identifying human needs and human factors of commonly encountered man–machine interfaces (e.g., computerized systems, command and control systems, instrument panels, etc.); theoretical underpinings of human factors and cognition; human reliability as information processors; methodologies for measuring and designing machine interfaces from the human factors viewpoint; case studies of successful man–machine interfaces; job design and technological change; "hands-on" experience in designing and evaluating interfaces. (Fall)

293 **Technical Enterprises** (3)
Essential features of technology-based companies from the entrepreneur's point of view. Team management of an enterprise in a computer-simulated environment. For those within technical firms and within government who depend on technical firms as suppliers. (Fall)

294 **Marketing of Technology I** (3)
Marketing industrial goods and high-technology projects; special attention to the federal government as a market. Products, channels, pricing, promotion, and personal selling as elements of strategy. (Spring)

295 **Management of Technical Information** (3)
Logical and physical structures of data bases: record structures, transaction processing, access methods, inverted files. Traditional storage techniques, data base management systems, relational data bases, data base for computer aided engineering. (Fall and Spring)

297 **Problems in Engineering Administration** (3)
Project course providing the student with the opportunity to apply the various concepts and tools previously studied to the solution of a problem in engineering administration. Students work individually or in small groups, each on a problem proposed by the student and approved by the instructor. (Fall, Spring, Summer)

298 **Research** (arr.)
Basic or applied research in engineering administration or systems analysis. May be repeated for credit. Open to master's degree candidates in the department. (Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

311 **Marketing of Technology II** (3)
Special attention to marketing research, negotiation, and international marketing. Required for master's degree candidates in the marketing of technology program. Prerequisite: EAd 294 or permission of instructor. (Fall, even years)

321 **Management Information Systems and Networks** (3)
Advanced course in management information systems (MIS) with emphasis on technologies for making computer/communication networks a reality. Traditional methodologies used in the development of MIS, introduction of computer/communication networks and distributed data processing, and the resulting impact and trends in the development of MIS within organizations. Prerequisite: EAd 254 or permission of instructor. (Fall and Spring)

386 **Advanced Topics in Management** (3)
Reading and discussion of classical and important recent literature concerning the philosophy and application of management principles. (Fall, odd years)

387 **Technological Forecasting** (3)
Concepts and methodology: normative and exploratory forecasting, resource allocation and forecasting, technology transfer, technological change and its effects on forecasting, technology assessment. (Spring, even years)

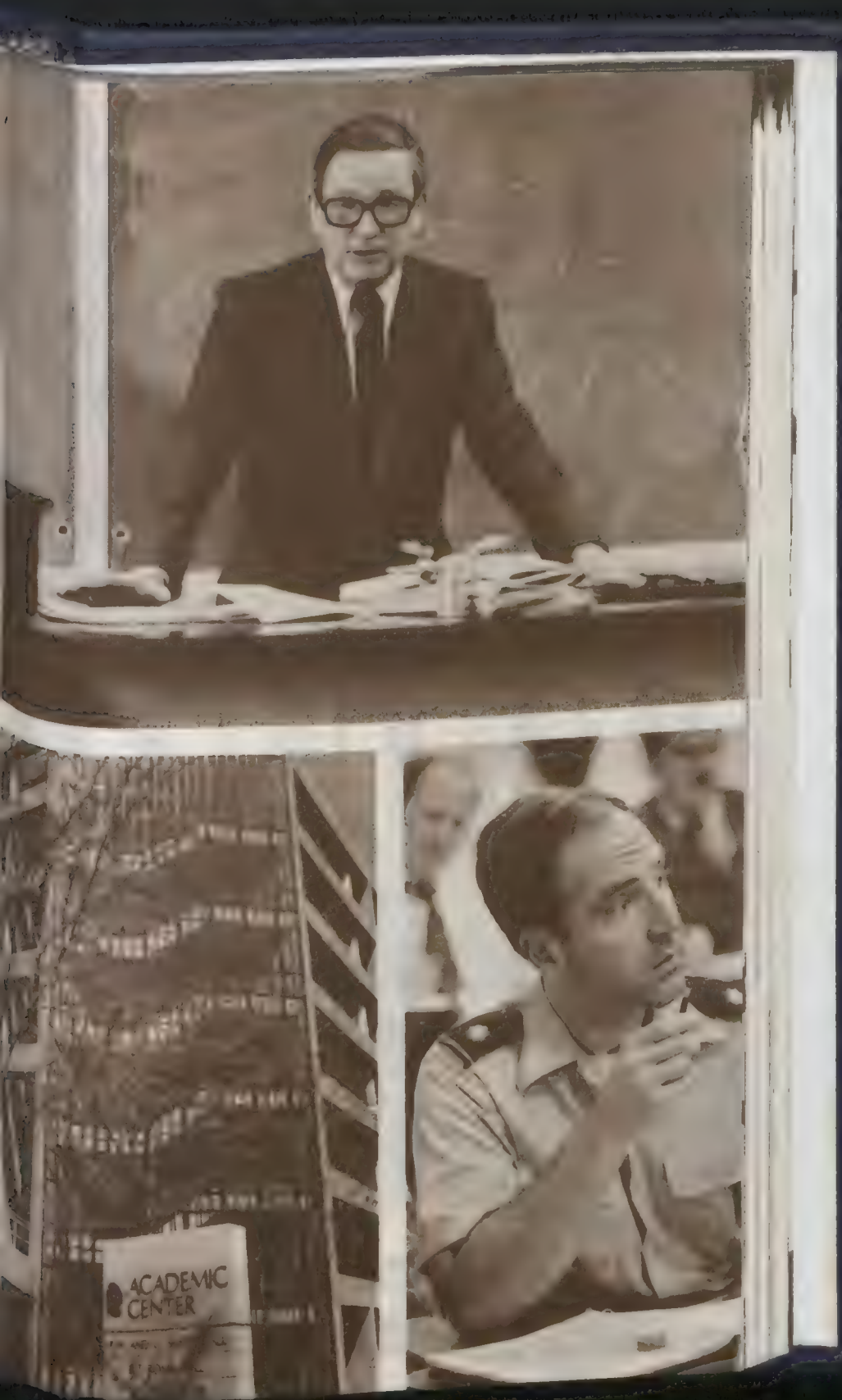
388 **Cost Effectiveness** (3)
Concepts of evaluation of engineered systems, current methods and trends in methodology, system resource requirements, probability and decision theory in cost effectiveness studies, systems approach to cost effectiveness studies. Prerequisite: EAd 160 or equivalent. (Spring, even years)

394 **Advanced Study** (arr.)
Limited to departmental professional degree students. May be repeated for credit. (As arranged)

395–96 **Seminar: Professional Project** (3–3)
Limited to professional degree candidates in the department. (Fall and Spring)

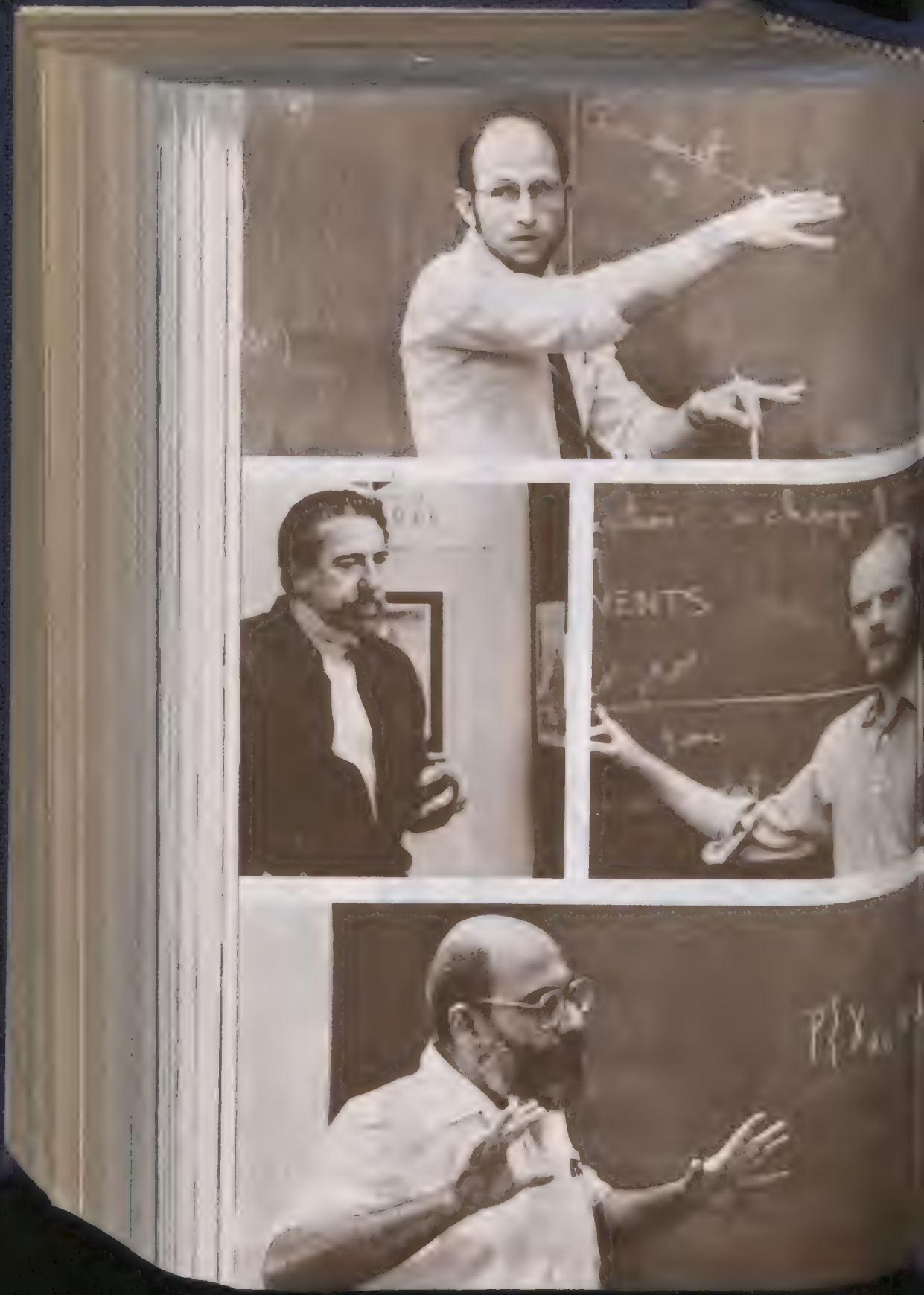
398 **Advanced Reading and Research** (arr.)
Limited to professional degree and Doctor of Science candidates. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)


ACADEMIC
CENTER




Operations
Research





Operations Research

Professors W.H. Marlow, D. Gross *(Chairman)*, N.D. Singpurwalla, A.V. Fiacco, G.P. McCormick, J.E. Falk, R.M. Soland, R.H. Clark *(Research)*, D.R. Miller

Professorial Lecturers J.D. Waller, C.C. Sherbrooke, W. R. Nunn, S.C. Tignor, C. Anello, G.R. McNichols, D.R. Edmonds, S.J. Balut

Associate Professorial Lecturers K.R. Hoffman, J.F. Ince, B.D. Nussbaum, P.J. Evanovich, J.W. Johnson, P.F. McCoy, W.P. Hutzler, S.E. Nevius, J.L. Kreuser, J.S.-H. Wu

Assistant Professorial Lecturer R.H.F. Jackson

Programs in operations research lead to the degrees of Bachelor of Science, Master of Science, and Doctor of Science and to the professional degree of Applied Scientist.

Undergraduate Program in Systems Analysis and Engineering

Systems analysis and engineering is the application of scientific methods and engineering techniques to the solution of management problems, especially where the most efficient and effective use of resources is concerned. Its practitioners seek to observe, understand, and predict the behavior of man–machine systems so that the best decisions about these systems can be made.

Applications of systems analysis and engineering are found almost everywhere: in the single waiting line now used at most banks and post offices; in the traffic signal synchronization that improves overall traffic flow; in the delivery and pickup routes and schedules of food distributors, delivery services, and garbage collection operators. Other applications include the choice of fire station locations; coordination and task scheduling for large construction projects; production-line scheduling for manufactured items such as automobiles and appliances; determination of spare parts needs for the automobile industry and for individual dealers; and calculation of "fair" multiple-shift work schedules for airline crews, nurses, police officers, and emergency service personnel.

Systems analysis and engineering, as an applied scientific discipline, has a body of specialized methods that are used to design, analyze, and improve operations and management systems. It is actually an interdisciplinary field, a synthesis of many disciplines that has evolved into an exciting field of its own. It combines many techniques and theories of engineering, mathematics, computer science, statistics, management, and economics.

Because a great range of applications and varied scientific techniques combine to make up the multidisciplinary approach of systems analysis and engineering, the profession is a dynamic and vital one. Systems analysis and engineering should be seriously considered by anyone attracted to the use of mathematics, statistics, engineering, and other sciences in finding solutions to decision problems with practical impact.

Core Curriculum

The first four semesters of work concentrate on the fundamentals of science and mathematics and also include study in English, the humanities, and the social sciences.

During the last four semesters, the student concentrates on professional courses in operations research, computer science, engineering administration, mathematics, and statistics. In addition, a technical elective track must be chosen that allows the student to concentrate in areas such as production systems, energy systems, management decision systems, computer systems, financial systems, and so forth, depending on his or her special interests.

First Semester

CSci 51: Applications of Computers (3)
Engl 9 or 10: English Composition: Language as Communication (3)
Math 31: Single-Variable Calculus I (3)
Phys 13: General Physics for Engineering and Applied Science (3)
Elective: Selected from humanities or social sciences (3)

Second Semester

Chem 13: General Chemistry (4)
CSci 52: Computers and Societal Problems (3)
Math 32: Single-Variable Calculus II (3)
Phys 14: Mechanics and Thermal Physics (3)
Elective: Selected from humanities or social sciences (3)

Third Semester

ApSc 57: Analytical Mechanics I (2)
ApSc 113: Engineering Analysis I (3)
CSci 147: Assembly Language Programming of Microcomputers (3)
Math 33: Multivariable Calculus (3)
Phys 15: Electricity and Magnetism (3)
Elective: Selected from humanities or social sciences (3)

Fourth Semester

ApSc 58: Analytical Mechanics II (3)
ApSc 114: Engineering Analysis II (3)
ApSc 115: Engineering Analysis III (3)
Math 124: Introduction to Matrix Theory (3)
Phys 16: Modern Physics (3)
Elective: Selected from humanities or social sciences (3)

Fifth Semester

ApSc 116: Engineering Analysis IV (3)
CSci 158: Algorithmic Methods (3)
CSci 161: Discrete Structures for Computing (3)
OR 101: Survey of Operations Research: Deterministic Models (3)
Stat 187: Introduction to Sampling (3)
Elective: Selected from humanities or social sciences (3)

Sixth Semester

CSci 159: Programming and Data Structures (3)
EAd 160: Introduction to Engineering Economic Analysis (3)
OR 102: Survey of Operations Research: Stochastic Models (3)
Stat 118: Regression Analysis (3)
Elective: Selected from humanities or social sciences (3)
Elective: *One* technical elective selected from the track chosen (see below for tracks)

Seventh Semester

CSci 155: Introduction to Numerical Methods for Computers (3)
OR 135: Analytic Methods for Management and Policy I (3)
OR 190: Applied Systems Analysis and Engineering (3)
Stat 181: Applied Time Series Analysis (3)
Elective: *One* technical elective selected from the track chosen

Eighth Semester

EAd 150: Introduction to Engineering Administration (3)
OR 151: Linear Programming (3)
OR 191: Problems in Operations Research (3)
Electives: *Two* technical electives selected from the track chosen

Technical Elective Tracks

Each student majoring in systems analysis and engineering must choose one of the following 13 tracks and select four of the courses therein as technical electives.

Computer Systems

CSci 151: System Software and Software Engineering (3)
CSci 156: Introduction to Operating Systems (3)
CSci 171: Computational Methods for Simulation (3)
CSci 177: Programming for Management Systems (3)
CSci 178: Introduction to Database Management (3)
CSci 185: Introduction to Computer Graphics (3)

Control and Instrumentation Systems

EE 11: Linear Networks I (3)
EE 12: Linear Networks II (3)
EE 172: Control Systems Design (3)
EE 184: Medical Engineering Instrumentation and Systems Design (3)

Electrical Energy Systems

EE 11: Linear Networks I (3)
EE 12: Linear Networks II (3)
EE 31: Fields and Waves I (3)
EE 177: Electrical Energy Conversion (3)

Electro-mechanical Systems

ME 117: Mechanical Engineering Computations (3)
ME 126: Fluid Mechanics I (3)

ME 134: Introduction to Vibration Analysis (3)
ME 182: Electromechanical Control System Design (3)

Environmental Systems

ME 126: Fluid Mechanics I (3)
CE 193: Hydraulics (3)
CE 194: Environmental Engineering I: Water Supply and Resources (3)
CE 197: Environmental Engineering II: Waste and Pollution Control (3)

Financial Systems

Acct 51: Introductory Accounting (3)
Acct 52: Introductory Accounting (3)
BAd 120: Business Finance (3)
BAd 123: Investment and Portfolio Management (3)

Management Decision Systems

BAd 140: Basic Marketing Management (3)
BAd 183: Logistics Management (3)
BAd 191: Fundamentals of Management (3)
BAd 193: Managing Production/Operations (3)
CSci 177: Programming for Management Systems (3)
CSci 178: Introduction to Database Management (3)

Mathematical Systems

Math 113: Graph Theory (3)
Math 121: Introduction to Abstract Algebra (3)
Math 122: Introduction to Abstract Algebra (3)
Math 139: Advanced Calculus I (3)
Math 140: Advanced Calculus II (3)
Math 157: Introduction to Complex Variable Theory (3)

Mechanical Energy Systems

CE 140: Materials Science (3)
ME 131: Thermodynamics (3)
ME 148: Thermodynamic Systems (3)
ME 194: Energy Conversion (3)

Naval Systems

NS 52: Naval Ships Systems I (3)
NS 125: Naval Ships Systems II (3)
NS 150: Navigation and Naval Operations I (3)
NS 151: Navigation and Naval Operations II (3)

Network Systems

EE 11: Linear Networks I (3)
EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 113: Network Analysis and Design (3)

Production Systems

BAd 191: Fundamentals of Management (3)
BAd 193: Managing Production/Operations (3)

CE 140: Materials Science (3)
ME 192: Product Design and Process Engineering (3)

Statistical Systems

Stat 119: Analysis of Variance (3)
Stat 149: Simulation and Modeling (3)
Stat 183: Intermediate Statistical Laboratory: Statistical Computing Packages (3)
Stat 188: Nonparametric Statistical Inference (3)

Postgraduate Work

Upon completion of the four-year degree program, the student may choose to study one more year and obtain a Master of Science degree in operations research. Graduates of the systems analysis and engineering curriculum are given two semester hours of advanced standing that are applicable to the master's program.

Operations Research Undergraduate Courses

101 **Survey of Operations Research: Deterministic Models** (3)
Basic concepts and techniques of deterministic operations research modeling as applied to problems in industrial, governmental, and military decision making. Linear, integer, nonlinear, and dynamic programming; networks, game theory. Prerequisite: Math 33 or equivalent. (Fall and Spring)

102 **Survey of Operations Research: Stochastic Models** (3)
Basic concepts and techniques of stochastic operations research modeling as applied to problems in industrial, governmental, and military decision making. Markov chains, queuing, inventory, reliability, forecasting, decision analysis, and simulation. Prerequisite: Math 33, ApSc 115, or equivalent (Fall and Spring)

135 **Analytic Methods for Management and Policy I** (3)
Various quantitative techniques such as simulation, statistics, cost/benefit analysis, cash flows and discounting, mathematical programming, difference equations, and their roles in policy analysis are presented in a theoretical context and viewed in terms of their utility in the management/policy spectrum. Prerequisite: Stat 51 or equivalent. (Fall)

151 **Linear Programming** (3)
Basic computational, theoretical, and applied areas with emphasis on the general linear programming problems; simplex procedures; duality problems; parametric linear programming and sensitivity analysis; transportation problems. Prerequisite: OR 101 or permission of instructor. (Fall and Spring)

190 **Applied Systems Analysis and Engineering** (3)
Use of existing computer software and development and use of student's computer programs to solve problems in systems analysis and engineering. Analysis and solution of case studies and design problems. Use of Engineering Administration/Operations Research Decision Support Systems Laboratory. Prerequisite: CSci 158, OR 101 and 102. (Fall)

191 **Problems in Operations Research** (3)
Field experience in operations research on a team basis. Each small group locates an actual problem and formulates a solution by operations research models. Class evaluation of progress. Prerequisite: knowledge of FORTRAN or BASIC. (Fall and Spring)

Graduate Programs in Operations Research

Master of Science Degree Program

The objective of the master's program in operations research is to prepare students with appropriate undergraduate backgrounds for in-depth study of analytically oriented techniques of management decision making and applications of these techniques.

Expanded scientific, statistical, and mathematical knowledge combined with growing needs in technological as well as social areas have created increased demand for individuals trained in operations research. The discipline of operations research uses scientific principles supported by statistical and mathematical methodology to study the function and structure of complex industrial, military, and social systems in an effort to evaluate the probable effects of proposed courses of action, to establish criteria to judge the effectiveness of these courses, and to assist in making optimal decisions. The program in operations research provides a scientific basis for solving problems involving the interaction of many factors and organizational components in the interest of the whole system. This breadth of interest is an example of the systems approach in the sense that a system is an interconnected complex of functionally related components. Most operations research efforts begin with specific aspects of a general problem and proceed to consideration of the system as a whole. Just as the engineer may start with the study of subsystems or components of a general problem, so may the operations research analyst.

Admission

In addition to the requirements for admission to graduate study (see pages 31–33), the applicant for the program in operations research leading to the Master of Science degree must have adequate knowledge of probability and statistics and computer programming. This requirement can be met by satisfactory completion of ApSc 115, 116, and CSci 100 or approved equivalents. It is generally possible to take these courses concurrently with courses taken for graduate credit; however, these undergraduate courses do not fulfill any part of the requirements for the master's degree.

Required Courses

Core courses required in the field of operations research are OR 201, 202, 209, 210, and 299–300 (for those electing a thesis) or 291 (for those not electing a thesis). Students must complete OR 201, 202, 209, and 210 before attempting any other courses; in certain cases, however, permission may be granted for concurrent registration. Students electing OR 291 normally complete this course in the last semester of study. The remainder of the program is selected, with the approval of the adviser, in an area of concentration from courses in the Department of Operations Research. Appropriate courses from other departments of the University may also be approved as electives.

Areas of Concentration

The goal of the Department of Operations Research is to provide programs flexible enough to accommodate both students interested in applications and

those interested in theory. Specific areas of concentration and suggested departmental electives follow.

General Operations Research

OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 261: Theory of Games
OR 275: Introduction to Scheduling
OR 277: Queuing Theory
OR 279: Inventory Control

With the approval of the adviser, other courses within the department may be elected.

Defense Science

OR 237: Logistics Planning
OR 251: Linear Programming
OR 261: Theory of Games
OR 262: Decision Analysis
OR 273: Discrete Systems Simulation
OR 281: Reliability Theory I

With the approval of the adviser, other courses within the department may be elected.

Energy Systems

OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 271: Forecasting Techniques
OR 277: Queuing Theory
OR 279: Inventory Control

With the approval of the adviser, courses may be elected from the Department of Civil, Mechanical, and Environmental Engineering.

Logistics Engineering

OR 237: Logistics Planning
OR 251: Linear Programming
OR 253: Integer and Network Programming
OR 271: Forecasting Techniques
OR 275: Introduction to Scheduling
OR 279: Inventory Control
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the departments of Economics, Engineering Administration, Management Science, and Electrical Engineering and Computer Science.

Management Science

For a description of the management science concentration, see p. 228.

Mathematical Modeling in Information Systems

OR 251: Linear Programming
OR 271: Forecasting Techniques
OR 273: Discrete Systems Simulation

OR 275: Introduction to Scheduling
OR 277: Queuing Theory

With the approval of the adviser, courses may be elected from the departments of Electrical Engineering and Computer Science, Engineering Administration, and Management Science.

Mathematical Optimization

OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 253: Integer and Network Programming
OR 261: Theory of Games
OR 275: Introduction to Scheduling

With the approval of the adviser, courses may be elected from applied science offerings and the Department of Mathematics.

Model Building for Transportation Flows

OR 231: Theory of Traffic Flow
OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 273: Discrete Systems Simulation
OR 277: Queuing Theory
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the departments of Civil, Mechanical, and Environmental Engineering; Engineering Administration; and Urban and Regional Planning.

Operations Research in Industrial Engineering Systems

OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 237: Logistics Planning
OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 271: Forecasting Techniques
OR 273: Discrete Systems Simulation
OR 275: Introduction to Scheduling
OR 277: Queuing Theory
OR 279: Inventory Control
OR 281: Reliability Theory I

With the approval of the adviser, other courses within the department may be elected.

Quantitative Decision Making for Public Policy

OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 251: Linear Programming
OR 261: Theory of Games
OR 271: Forecasting Techniques
OR 273: Discrete Systems Simulation

With the approval of the adviser, courses may be elected from the departments of Civil, Mechanical, and Environmental Engineering; Economics; Public Administration; and Urban and Regional Planning.

Stochastic Modeling

OR 271: Forecasting Techniques
OR 273: Discrete Systems Simulation
OR 277: Queuing Theory
OR 279: Inventory Control
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Department of Statistics.

Graduate Study in Management Science—Master of Science Degree Program

The objective of the master's program in management science is to prepare students to utilize the quantitative techniques of modern management. This program emphasizes a thorough understanding of quantitative approaches to problems of managerial control and decision making. While it develops background in the basic mathematics associated with various techniques, it is oriented toward the quantitative modeling of decision and control problems and their solution by application of the techniques in the form of modern management science software. It stresses the efficient use of such software and aims to prepare the student for effective administration and use of operations research.

Admission

In addition to the requirements for admission to graduate study (see pages 31–33), the applicant for the program in management science leading to the Master of Science degree must have adequate introductory knowledge of mathematics and statistics. This requirement can be met by satisfactory completion of Math 3 and Stat 51 or approved equivalents.

Required Courses

Core courses required in the field of management science are OR 201, 202, 230, 235, 299–300 (for those electing a thesis) or 291 (for those not electing a thesis), and EAd 287. Students must complete OR 201, 202, 230, and 235 before attempting any other courses; in certain cases, however, permission may be granted for concurrent registration. Students electing OR 291 normally complete this course in the last semester of study. The remainder of the program is normally selected, with the approval of the adviser, from courses in the departments of Operations Research, Engineering Administration, and Economics; the following courses are suggested for consideration:

OR 236: Analytic Methods for Management and Policy II
OR 251: Linear Programming
Econ 217: Survey of Economics
Econ 218: Survey of Economics
EAd 251: Management of Information Resources
EAd 253: Production Management
EAd 254: Automatic Data Processing Systems
EAd 269: Elements of Decision Making and Problem Solving
EAd 287: Decision Support Systems and Models
EAd 295: Management of Technical Information

Professional Degree Program

This program of advanced study and research leads to the degree of Applied Scientist. The program is designed to provide an educational opportunity for students interested in pursuing post-master's study with emphasis on applied subject matter rather than on basic research.

Admission

In addition to the general requirements for admission to professional degree study (see pages 37–38), admission requires an appropriate master's degree from a recognized institution and evidence of a capacity for productive work as indicated by prior scholarship. The applicant must also possess a bachelor's degree in engineering, mathematics, or administration. In certain cases, applicants having an equivalent quantitative background may be considered for admission by the department.

Program of Study and Requirements

The program of study consists of an applied operations research major and an applied out-of-department minor. A minimum of 30 semester hours is required to earn the professional degree. This 30-hour minimum includes (a) a minimum of 12 hours in operations research, (b) Stat 201–202, (c) a 9-hour applied minor in a field other than operations research, and (d) either a 3-hour professional degree project (OR 391) or another 300-level course in operations research. Appropriate minor areas include economics; engineering administration; systems analysis; computer science; systems science, networks, and controls; urban and regional planning; transportation systems; environmental engineering; and energy systems. Professional degree candidates in operations research must pass the department's Master's Comprehensive Examination (MCE) before their final program of study can be approved. Full-time students are advised to attempt the MCE within one year of their admission; all students must take the examination within two years. Extensions are permissible at the department's discretion.

Doctor of Science Degree Program

Programs in operations research leading to the degree of Doctor of Science provide advanced study and research to enable students to extend their fields of knowledge and to enhance their career opportunities in research, analysis, management, administration, or education.

Admission

In addition to the general requirements for admission to doctoral study (see pages 40–42), the applicant for the doctoral program in operations research must have a master's degree, with a superior record of academic achievement. Outstanding professional performance is also considered in evaluating applicants.

Language Requirement

No foreign language is required for the Doctor of Science degree program in operations research. A proficiency in one computer programming language must be demonstrated before the student is admitted to the doctoral qualifying examination.

Programs of Study

Doctoral programs are planned so that the student may obtain adequate breadth in operations research and sufficient depth in areas of specialization, which will enable the completion of a dissertation that will be a significant contribution to the field. Possible areas of study include mathematical programming, multicriteria decision making, inventory, queuing, and reliability. In addition to the major in operations research, two minor areas of concentration are normally required. One minor generally is in applied science, mathematics, or statistics. The second minor may be chosen from within the department or from appropriate other departments of the University, such as Business Administration; Civil, Mechanical, and Environmental Engineering; Economics; Electrical Engineering and Computer Science; Engineering Administration; Health Care Administration; Management Science; and Urban and Regional Planning. Incoming doctoral candidates will normally be required to take the department's Master's Comprehensive Examination (MCE) and must demonstrate superior performance on that examination before final approval of the program of study can be granted. All doctoral candidates must attempt the MCE within two years of their admission; full-time students usually take it within one year. Extensions may be granted, at the discretion of the department. The general requirements for doctoral study are stated on pages 40–44).

Professional Fields and Research Interests of Operations Research Faculty

	Areas of Specialization	Areas of Recent Research
Rolf H. Clark	Capital budgeting Feedback modeling Managerial economics Policy analysis	Cost/benefit analysis Cost estimating and analysis Manpower planning Military planning
James E. Falk	Mathematical programming Numerical methods Mathematical modeling	Nonconvex programming Sequential optimization problems Sequential games Application of optimization methods to economics, military, logistics, and location problems

	Areas of Specialization	Areas of Recent Research
Anthony V. Fiacco	Mathematical programming Numerical methods Mathematical modeling Stability analysis	Penalty function methods Approximation and sensitivity analysis in nonlinear programming Parametric solution and bounding techniques Applications to water pollution, structural design, energy, and manpower
Donald Gross	Inventory theory Queuing theory	Queuing approximations Inventory models Closed queuing networks
W.H. Marlow	Mathematical methods and numerical procedures in operations research and management science	Logistics Systems effectiveness
Garth P. McCormick	Mathematical programming Numerical methods Mathematical modeling	Rate of convergence of algorithms Nonconvex programming Mathematical programming applied to pollution problems and conservation of resources Energy modeling
Douglas R. Miller	Applied probability Stochastic processes Simulation Mathematical statistics	Risk analysis Avionics maintenance models Statistical inference using empirical distributions Stochastic models in polymer engineering Algorithms for solving queuing and inventory models Software reliability
Nozer D. Singpurwalla	Applied probability and mathematical statistics Reliability theory and applications Time series analysis and forecasting Fault tree analysis Kalman filtering and its applications	Applications of time series analysis to reliability problems Bayesian theory and methodology Extreme value theory and applications Nonparametric characterizations of distributions and their testing Software reliability Maintenance policies

	Areas of Specialization	Areas of Recent Research
Richard M. Soland	Mathematical modeling Decision theory Mathematical programming	Optimal facility location Interactive multiple criteria optimization Multiple criteria decision models in the public and private sectors Solution and applications of structured integer programming problems Discrete optimization in stochastic systems

Operations Research Graduate Courses

201 **Survey of Operations Research: Deterministic Models** (3)
Basic concepts and techniques of deterministic operations research modeling as applied to problems in industrial, governmental, and military decision making. Linear, integer, nonlinear, and dynamic programming; networks; game theory. Prerequisite: Math 33 or OR 230 or equivalent. (Fall and Spring)

202 **Survey of Operations Research: Stochastic Models** (3)
Basic concepts and techniques of stochastic operations research modeling as applied to problems in industrial, governmental, and military decision making. Markov chains, queuing, inventory, reliability, forecasting, decision analysis, and simulation. Prerequisite: Math 33 and ApSc 115, or OR 230, or equivalents. (Fall and Spring)

209 **Mathematics in Operations Research I** (3)
Fundamental methods and practical procedures for deterministic decision models in operations research involving a number of variables. Applications of linear models for resource allocations. Applications to data representation and algorithmic procedures for linear and nonlinear optimization models. Applications of linear algebra and real multivariate analysis. Prerequisite: Math 33 or equivalent. (Fall and Spring)

210 **Mathematics in Operations Research II** (3)
Fundamental methods and practical procedures for stochastic decision models in operations research involving applications of complex variables. Applications of linear differential, difference, and differential-difference systems to various areas in operations research. Applications of modern numerical methods. Prerequisite: Math 33 or equivalent. (Fall and Spring)

230 **Introduction to Management Science** (3)
Emphasizes use of microcomputers in formulating and solving quantitative decision problems of management science and operations research. Familiarization with microcomputers, elements of BASIC programming language, use of existing software packages, and appropriate mathematical fundamentals in the areas of functions, linear equations and matrices, and elementary calculus. Classes will utilize microcomputers in the Engineering Administration/Operations Research Departments' Decision Support Systems Laboratory. Prerequisite: Math 3 or equivalent. (Fall and Spring)

231 **Theory of Traffic Flow** (3)
Definitions and measurement of traffic stream parameters; dynamic theories. Follow-the-leader models of traffic flow, kinematic theories and fluid analogies, traffic cybernetics, statistical distributions and queuing theory, stochastic approaches to static delay problems, simulation of traffic problems. Prerequisite: Math 33 and ApSc 115, or equivalents. (As arranged)

232 **Applications of Linear and Nonlinear Optimization Theory** (3)
Introduction to penalty function methods for solving linear and nonlinear optimization problems through use of existing computer codes. Formulation of optimization models in application areas of structural design, nutrition, pollution control, inventory control, energy, economics, psychology, statistics, and chemical processes. Prerequisite: Math 33 or equivalent. (Fall)

235 **Analytic Methods for Management and Policy I** (3)
(Same as Econ 211)
Various quantitative techniques such as simulation, statistics, cost/benefit analysis, cash flows and discounting, mathematical programming, difference equations, and their roles in policy analysis are presented in a theoretical context and viewed in terms of their utility in the management/policy spectrum. Prerequisite: Stat 51 or equivalent. (Fall)

236 **Analytic Methods for Management and Policy II** (3)
(Same as Econ 212)
For graduate students in fields other than engineering and operations research. An applied course using manual and computer routines to explore, through case studies, techniques in optimization and statistical analysis. The former stresses applications of mathematical programming; the latter, estimation and regression analysis. Reviews theory (and requires application) of policy simulation techniques, including growth theory, system dynamics, and stock/flow analysis. Prerequisite: OR 235. (Spring)

237 **Logistics Planning** (3)
Quantitative methods in model building for logistics systems including organization, procurement, transportation, inventory, maintenance, and their interrelationships. Stresses applications. Prerequisite: Math 33 and ApSc 115; or equivalents. (Spring, even years)

251 **Linear Programming** (3)
Basic computational, theoretical, and applied areas with emphasis on the general linear programming problems; simplex procedures; duality problems; parametric linear programming and sensitivity analysis; transportation problems. Prerequisite: OR 201 or permission of instructor. (Fall and Spring)

252 **Nonlinear Programming I** (3)
Basic topics in optimization theory, including first- and second-order optimality criteria, convexity, duality, and algorithms. Methods for solving unconstrained, linearly constrained, and nonlinearly constrained problems. Applications. Prerequisite: OR 201 or permission of instructor. (Spring)

253 **Integer and Network Programming** (3)
Methods and applications of optimization problems requiring integral solutions. Implicit enumeration, branch and bound, and cutting plane methods. Network programming, including shortest route, maximum flow, minimum cost flow, and minimum spanning tree problems. Elements of computational complexity. Prerequisite: OR 201, 251; or permission of instructor. (Fall, even years)

261 **Theory of Games** (3)
Study of mathematical models with applications to the relationships among independent competitive entities (persons or organizations in environment of competition, bargaining, bidding), selection of optimum strategies, mini–max concept, connections with linear programming and decision functions, two-person and n-person zero and nonzero sum games. Prerequisite: OR 201 or permission of instructor. (Fall)

262 **Decision Analysis** (3)
Study of decision making under certainty and uncertainty and under one and several criteria. Decision analysis and decision trees, the value of informa-

tion, subjective probability and Bayesian statistics, utility and value theories, multiple criteria decision making and multiple criteria optimization, and goal programming. Prerequisite: ApSc 116, OR 201 and 202; or permission of instructor. (Spring, odd years)

271 **Forecasting Techniques** (3)
Introduction to various techniques of forecasting available to an operations research analyst or engineer. Topics include the use of regression analysis in forecasting and other heuristic forecasting techniques. Emphasis on detailed development of the Box–Jenkins technique for time-series analysis, including moving averages and exponential smoothing as special cases. Application to engineering, business, and economic situations, using special computer program packages. Prerequisite: ApSc 116 and OR 202; or equivalents. (Fall, odd years)

273 **Discrete Systems Simulation** (3)
Monte Carlo simulation of discrete stochastic models. Modeling complex operations research systems. Simulation languages. Random number and random deviate generation. Statistical design and analysis of simulation experiments. Validation of simulation models. Applications include queuing, inventory, scheduling, and computer models. Prerequisite: ApSc 116, CSci 51, and OR 201, 202; or equivalents; or permission of instructor. (Spring)

275 **Introduction to Scheduling** (3)
Theory of scheduling with emphasis on industrial applications, assembly line balancing, sequencing and scheduling of jobs in machine shops. Mathematical optimization, heuristic programming, and computer simulation approaches to these problems are examined. Prerequisite: OR 201, 202, and 251; or permission of instructor. (Spring, even years)

277 **Queuing Theory** (3)
Characterization of queuing systems. Single-channel exponential models. Additional Markovian single- and multiple-channel models, including birth–death processes, finite sources, bulk queues, Erlangian models, and series queues. Models with general arrival and service patterns. Model building, basic solution techniques, and formal theoretical developments. Prerequisite: ApSc 116 and OR 202; or permission of instructor. (Spring)

279 **Inventory Control** (3)
Application of mathematical techniques to decisions regarding when and how much to produce or purchase. Various mathematical models of inventory systems with deterministic and stochastic demands, continuous and periodic review policies, multi-item models with constraints, and multi-echelon models. Demand uncertainty and forecasting in inventory models. Prerequisite: ApSc 116 and OR 202; or permission of instructor. (Fall)

281 **Reliability Theory I** (3)
Topics introducing the mathematical and statistical theories of reliability. Mathematical theory: theory of coherent structures, association of random variables, stochastic characterization of wear, total positivity, preservation theorems, and bounds and inequalities. Statistical theory: probabilistic derivation of failure models; censored, truncated, and sequential life testing procedures using Bayesian techniques; commonly used military standard plans. Prerequisite: ApSc 116 and OR 202; or equivalents. (Fall)

282 **Quality Control and Acceptance Sampling** (3)
Topics covering the mathematical and statistical approaches to quality assurance. Control charts, acceptance sampling by attributes and variables, outgoing quality levels, cost of quality, relationship between reliability and quality, Bayesian techniques and time series methods. Prerequisites: ApSc 116; OR 271 or 281; or permission of instructor. (Fall, odd years)

291 **Problems in Operations Research** (3)
Field experience in operations research on a team basis. Each small group locates an actual problem and formulates a solution by operations research

models. Class evaluation of progress. Prerequisite: Knowledge of FORTRAN or BASIC. (Fall and Spring)

297 **Special Topics in Operations Research** (3)
Selected topics in operations research, as arranged. Prerequisite: permission of instructor. May be repeated for credit.

298 **Research** (arr.)
Basic or applied research in operations research. May be repeated for credit. (Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

351 **Advanced Topics in Mathematical Programming** (3)
Special topics selected from fractional and geometric programming, branch-and-bound methods, max–min problems, pseudo-Boolean programming, calculus of variations, optimal control, penalty function methods, Lagrangian algorithms, fixed point procedures, sensitivity analysis, and large-scale programming. Prerequisite: OR 252 or permission of instructor. (Spring)

352 **Nonlinear Programming II** (3)
Continuation of OR 252. Optimality conditions, convex analysis, and the development of families of unconstrained and constrained algorithms are studied in greater depth. Key results will be selected for discussion from several topics of current importance in mathematical programming, e.g., duality, rate of convergence, nonconvex programming, factorable functions, and sensitivity analysis. Prerequisite: OR 252 or permission of instructor. (Fall)

371 **Advanced Topics in Forecasting** (3)
Continuation of OR 271 for those who wish to develop further capability in this area. Brief review of OR 271, estimation of parameters of Box–Jenkins models, transfer function models for relating two or more time series, models for intervention analysis, and models for feedforward and feedback control schemes. Kalman filtering and Bayes empirical Bayes methods in forecasting. Other techniques useful in forecasting, such as spectral analysis of time series, including cross-spectral analysis and Fourier analysis. Review and discussion of current literature. Prerequisite: OR 271 or equivalent, or permission of instructor. (Spring, even years)

377 **Advanced Stochastic Models in Operations Research** (3)
Selected applied probability models, including the Poisson process, renewal theory, Markov chains, semi-Markov processes, regenerative processes, and continuous-time denumerable-state Markov processes. Applications to queues, inventories, and other operations research systems. Special topics. Prerequisite: ApSc 116 and OR 277; or permission of instructor. (Fall)

381 **Reliability Theory II** (3)
Topics of current interest in the mathematical and statistical theories of reliability. Mathematical theory includes stochastic characterization of multivariate survival, shock models and wear processes, and reliability theory for multistate components. Statistical theory includes recent developments in analysis of failure data. Prerequisite: OR 281. (Spring, odd years)

391 **Project for Professional Degree** (3)
Limited to students in the professional degree program. (Fall and Spring)

397 **Advanced Topics in Operations Research** (3)
Advanced topics from the literature of operations research for analysis, presentation, and discussion. Reading assignments from professional journals selected by the instructor and the student. May be repeated for credit. Admission by permission of instructor. (Fall and Spring)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)



Required Courses in Engineering and Applied Science Undergraduate Curricula Offered by Columbian College of Arts and Sciences and Graduate School of Arts and Sciences

For convenience, descriptions of required courses in undergraduate curricula offered by Columbian College of Arts and Sciences and the Graduate School of Arts and Sciences are listed here. See the *Undergraduate and Graduate Arts and Sciences Programs Bulletin* for elective courses in the humanities and social sciences.

Biochemistry

221–22 **General Biochemistry (4–4)**
A comprehensive course in general biochemistry for graduate students in biomedical sciences and undergraduate students in biology and chemistry. Prerequisite: Chem 152, 154. (Academic year)

Biological Sciences

Biology

11–12 **Introductory Biology for Science Majors (4–4)**
Lecture (3 hours), laboratory (3 hours). BiSc 11: Investigation of principles of inheritance, physiology, development, and cell biology. BiSc 12: General survey of microorganisms, plants, and animals, including morphology, physiology, embryology, ecology, and evolutionary relationships among phyla. Designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Material fee, $40 per semester. (Academic year)

Zoology

145 **Principles of Development (4)**
Lecture (2 hours), laboratory (4 hours). Development of animals, especially vertebrates, with reference to human embryos. Principles are illustrated by modern experimental studies of developmental problems. Laboratory analysis of organ system formation in the frog, chick, and pig. Material fee, $40. (Fall; Spring, even years)

148 **Histology (4)**
Lecture (2 hours), laboratory (4 hours). Introduction to microscopical anatomy of normal tissues and organs with emphasis on the interrelationship of structure and function. Material fee, $40. (Spring; Fall, odd years)

Chemistry

13 **General Chemistry (4)**
For engineering and applied science students only. Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Atomic structure, chemical bonding; chemical equations; acids and bases; chemical equilibrium; liquid and solid states; periodicity; electrochemistry. Prerequisite or concurrent registration: Math 31, Phys 14. Laboratory fee, $35. After completion of Chem 13, Chem 11–12 may not be taken for credit. (Fall and Spring)

22 **Introductory Quantitative Analysis** (5)
Lecture (3 hours), laboratory (6 hours). Theory and practice of quantitative analysis by classical and modern methods; evaluation of analytic data emphasizing detection and correction of experimental errors. Prerequisite: Chem 12 or 16. Laboratory fee, $35. (Fall and Spring)

151–52 **Organic Chemistry** (3–3)
Chemistry of the compounds of carbon. Prerequisite to Chem 151: Chem 12 or 16. Prerequisite to Chem 152: Chem 151. (Academic year)

153–54 **Organic Chemistry Laboratory** (1–1)
Laboratory complement of Chem 151–52. Prerequisite or concurrent registration: Chem 151–52. Prerequisite to Chem 154: Chem 153. Laboratory fee, $35 per semester. (Academic year)

English

*9 **English Composition: Language as Communication** (3)
Intensive grammar and composition course for students inadequately prepared for Engl 10. Detailed instruction, drill, and exercises in basic structure and writing paragraphs; also includes content covered in Engl 10. Class meets five hours per week. Special fee, $25. (Fall and Spring)

*10 **English Composition: Language as Communication** (3)
Study and practice of expository techniques; emphasis on the rhetorical complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure. (Fall and Spring)

Geology

136 **Introduction to Engineering Geology** (3)
For students in the School of Engineering and Applied Science. Geological principles and processes and their application to civil and mechanical engineering. Prerequisite: Phys 2 or equivalent, or permission of instructor. Laboratory fee, $20. (Fall and Spring)

Mathematics

31 **Single-Variable Calculus I** (3)
Differentiation and integration of algebraic functions, exponentials, and logarithms with simple applications. Arc length. Conic sections. Prerequisite: Math 30 or equivalent. (Fall and Spring)

32 **Single-Variable Calculus II** (3)
Calculus of trigonometric and hyperbolic functions. Techniques of integration. Taylor formula. L'Hopital's rules. Infinite series; polar coordinates; three-dimensional vectors. Prerequisite: Math 31. (Fall and Spring)

33 **Multivariable Calculus** (3)
Vector-valued functions. Partial differentiation. Multiple integrals. Topics in vector calculus. Prerequisite: Math 32. (Fall and Spring)

101 **Introduction to Mathematical Logic** (3)
Introduction to proof theory and model theory of propositional and predicate calculi, computability, topics from foundations of mathematics. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Fall)

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* Students whose College Board English Composition Achievement Test scores suggest inadequate preparation may be assigned to Engl 9 or may be tested in vocabulary, spelling, grammar, standard usage, and writing skill before placement in either Engl 9 or 10.

113 **Graph Theory** (3)
Directed and undirected graphs; bridges, cutpoints, and blocks; connectivity; partitions; Eulerian and Hamiltonian graphs; planarity; coloring problems. Flow charts for computer applications. Prerequisite: Math 32. (Fall and Spring)

121–22 **Introduction to Abstract Algebra** (3–3)
Selected topics in elementary number theory, groups, rings (including polynomial rings), and fields. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Academic year)

124 **Introduction to Matrix Theory** (3)
Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors. Hamilton-Cayley theorem. Systems of linear difference and differential equations. Quadratic forms. Applications to economic, biological, and physical models. Prerequisite: Math 32 or 42 or permission of instructor. (Fall and Spring)

139 **Advanced Calculus I** (3)
Topology of R^n. Continuous mappings. Uniform convergence. Differentiable mappings. Prerequisite: Math 33. (Fall)

140 **Advanced Calculus II** (3)
Contraction maps, implicit function and differential equation theorems. Integration theory. Differential forms. Stokes' theorem. Prerequisite: Math 139 or equivalent. (Spring)

157 **Introduction to Complex Variable Theory** (3)
Analytic functions. Power series. Contour integration and calculus of residues. Conformal mapping. Physical applications. Prerequisite: Math 139. (Fall)

Physics

13 **General Physics for Engineering and Applied Science** (3)
Lecture (2 hours); recitation and laboratory (2 hours). Development of basic principles of optics and dynamics. Geometrical optics, vector algebra, statics of rigid bodies, hydrostatics, single-particle kinematics and dynamics, and conservation of energy. Concurrent registration in Math 31 is required. Laboratory fee, $20.

14 **Mechanics and Thermal Physics** (3)
Lecture (2 hours); recitation and laboratory (2 hours). Elementary development of mechanics for many-particle systems and basic thermodynamics. Collisions, rotational motion, small vibrations, gravitation, fluid dynamics, wave motion, ideal gas, laws of thermodynamics, and thermal properties of solids and liquids. Prerequisite: Phys 13 and Math 31. Laboratory fee, $20.

15 **Electricity and Magnetism** (3)
Lecture (2 hours), recitation and laboratory (2 hours). Introductory aspects of electromagnetic theory. Static electric fields. Coulomb's Law, Gauss's Law, electrical potential, capacitance and dielectrics, electric current and resistance, Ampere's Law, Faraday's Law, Maxwell's equations in integral form, electromagnetic waves. Prerequisite: Phys 14; Math 31. Laboratory fee, $20.

16 **Modern Physics** (3)
Lecture (2 hours), recitation and laboratory (2 hours). Elementary approach to the basic principles of quantum theory. Wave-particle duality, the hydrogen atom, Pauli's exclusion principle, x-ray spectra, atomic nucleus, radioactivity, nuclear reactions, statistical distribution laws, applications to molecular and solid-state physics. Prerequisite: Phys 14, 15; Math 32. Laboratory fee, $20.

Statistics/Computer and Information Systems

118 **Regression Analysis** (3)
Lecture (3 hours), laboratory (1 hour). Simple and multiple linear regression, partial correlation, residual analysis, stepwise model building, multicollinearity and diagnostic methods, indicator variables. Prerequisite: 3 semester hours selected from Stat 51, 53, 91, 104, 127. Laboratory fee. (Fall and Spring)

119 **Analysis of Variance** (3)
Lecture (3 hours), laboratory (1 hour). Introduction to the design of experiments and analysis of variance; random block, factorial, Latin square, and analysis of covariance. Prerequisite: Stat 118. Laboratory fee. (Spring)

181 **Applied Time Series Analysis** (3)
Autoregressive integrated moving average (ARIMA) modeling and forecasting of univariate time series. Estimation of spectral density functions, white noise tests, and tests for periodicities. Theory and applications using SAS on the GWU computer. Prerequisite: Math 33, Stat 157–58 or 118.

187 **Introduction to Sampling** (3)
Problems of sampling and sample design. Prerequisite: Stat 91 or equivalent. (Fall)

188 **Nonparametric Statistical Inference** (3)
Statistical inference when the form of the underlying distribution is not fully specified. Nonparametric procedures for estimation and testing hypotheses. An introduction to robust procedures. Prerequisite: Stat 91 or equivalent. (Spring)









Registration

The dates, hours, and place of registration are stated in the *Schedule of Classes*, which is available well in advance of each semester.

New and readmitted students cannot register for classes without having received a letter of admission to the University issued by the appropriate admitting office.

No registration is accepted for less than a semester or less than one summer session.

Students may not register concurrently in this University and another institution without the prior permission of the dean of the college, school, or division in which the student is registered in this University. Registration in more than one college, school, or division of the University requires the written permission of the deans concerned prior to registration. Allowance of credit for work done concurrently at another institution is at the discretion of the appropriate department.

Eligibility for Registration

Registration for the following categories of campus students is held on the days of registration stated in the University Calendar. A student who is suspended or whose record is not clear for any reason is not eligible to register.

New Student—Upon receipt of a letter of admission, the new student is eligible for registration on the stated days of registration.

Readmitted Student—A student previously registered in the University who was not registered for campus courses during the preceding semester or summer session must apply for and receive a letter of readmission from the appropriate admitting office before the student is eligible for registration.

Continuing Student—A student registered for campus courses or having continuous enrollment or leave of absence status in the immediately preceding semester or the summer session preceding the fall semester is eligible to register, assuming good standing and enrollment in a continuing program

Graduate Registration

Registration in master's thesis courses (201–300) entitles the student, during the period of registration, to the advice of the member of the faculty under whom the thesis is to be written. In the event a thesis is unfinished, an additional semester will be granted. If preparation of the thesis extends beyond the three-semester period, approval for another extension will be required; the student must repeat thesis course 300 and pay tuition as for a

repeated course, provided the overall time limit for earning the degree will not be exceeded.

Full-time doctoral students must register for a minimum of 12 semester hours per semester until 24 hours of work have been completed beyond the qualifying examination and for a minimum of 4 semester hours of continuous research per semester thereafter until satisfactory completion of the final examination.

Part-time doctoral students must register for a minimum of 6 semester hours per semester until 24 hours of work have been completed beyond the qualifying examination and for a minimum of 4 semester hours of continuous research per semester thereafter until satisfactory completion of the final examination.

No minimum hour load is required during the summer sessions.

Completion of Registration

Registration is not complete until financial settlement is made. Attendance in class is not permitted until registration has been completed.

Registration Changes and Withdrawals

See pages 247–248 and 258–259.

Registration for Consortium Courses

Degree students interested in taking courses at any of the other institutions in the Consortium of Universities of the Washington Metropolitan Area, Inc. should consult the program announcements of the other institutions. Consortium application forms and instructions may be picked up in the Office of the Registrar after obtaining registration materials. To participate in the Consortium program, students must obtain the approval of an adviser and should ascertain their eligibility to take the course and whether there is space in the class from the department of the institution where the course is taught. Specific inquiries should be addressed to the Registrar.

Fees and Financial Regulations

Fees paid by students cover only a portion of the cost of the operation of the University. Income from endowment funds, grants, and gifts from alumni and friends of the institution makes up the difference.

The following fees and financial regulations were adopted for the 1985 summer sessions and the 1985–86 academic year.

Tuition Fees

Each semester hour, not to exceed $4,035.00 per fall or spring semester	$299.00
Each semester hour, summer sessions	265.00

University Center Fee
(charged all students registered on campus)

Each semester hour, not to exceed $82.50 per semester	7.75

Additional Course Fees

In certain courses additional fees, such as laboratory and materials fees, are charged by semester as indicated in the course descriptions. If breakage of apparatus is in excess of the normal amount provided for in the laboratory fee, the student will be required to pay such additional charges as are determined by the department concerned.

Computer Usage Fees

(charged for courses that use the computer facilities of the University)

Applicable fees are listed in the *Schedule of Classes* for each semester. The fee is $50 per course, but no student will be charged more than $100 per semester for computer use.

Residence Hall Fees

See pages 267–268.

Special Fees and Deposits

Application fee (undergraduate degree candidates), nonrefundable	$20.00
Application fee (graduate degree candidates), nonrefundable	35.00
Advanced tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student	100.00
Housing deposit, nonrefundable, charged each applicant for residence hall space	200.00
Admission tests (when required)	15.00
Late-registration fee, for failure to register within the designated period:	
During first week of classes	25.00
During second and third week of classes	50.00
After third week of classes (if permitted)	100.00
Late-payment fee, for failure to make payments when due (see *Payment of Fees* below)	15.00
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see *Payment of Fees* below)	35.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason	15.00
Binding fee, for master's thesis	15.00
Fee for microfilm service and printing announcement of final examination for doctoral degree	75.00
Engineers' Council fee, charged each student in the School of Engineering and Applied Science for each semester or any part thereof except the summer term	8.00
Special Columbian College of Arts and Sciences departmental examination to qualify for receiving credit (advanced standing), waiver of requirement, or both	25.00
Waiver examination to qualify for advanced placement	5.00
English test for international students (when required)	10.00
Laboratory checkout fee, for failure to check out of chemistry laboratory by the deadline date set by the instructor*	10.00

* A student who drops a chemistry course before the end of the semester must check out of the laboratory at the next regular laboratory period.

Transcript fee	2.00
If two or more transcripts are requested at the same time, fee for each of the first two copies is $2; fee for each additional copy	.50
Replacement of lost or stolen picture identification card	2.00

Registration for on-campus courses in the University entitles each student to the following: (1) the services of the Career Services Center; (2) the use of the Melvin Gelman Library; (3) gymnasium privileges; (4) admission to all athletic contests, unless otherwise specified; (5) subscription to the *Hatchet*, the student newspaper; (6) admission to University debates; and (7) medical attention as described under Student Health Service. These privileges terminate when the student withdraws or is dismissed from the University.

Payment of Fees

No student is permitted to complete registration or attend classes until all charges are paid or until arrangements for payment have been made. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks and postal money orders should be made out to George Washington University, with the student identification number in the upper left corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration, permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the eighth week of classes for the fall and spring semesters. Interest at the rate of 8% per annum on the unpaid balance will be charged from the date of registration to the date payment is made. A 10-month payment plan is also available.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $800 or more. Under such circumstances the student may be permitted to pay one-half of the amount due from the student at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will automatically be charged a $15 late-payment fee and will be subject to the interest charge of 8% per annum. Accounts that become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. In addition, applications for institutional and federal financial aid cannot be processed until all encumbrances, including those for unpaid emergency loans, have been paid. Financial settlement will require payment in full of all amounts due to the University in addition to a financial reinstatement fee of $35.

Students auditing courses are subject to all fees charged to students registered for credit.

Returned-Check Policy

A student whose check is returned unpaid by the bank for any reason will be charged a returned-check fee. If the check is not paid within 15 days, the student's account will be financially encumbered, with the same penalties and restrictions as for late payment enumerated above.

One-Year Prepaid Tuition Plan

Undergraduate students paying the set upper limit of tuition may receive a discount for the spring semester if payment is made for the full academic year at the time of fall registration. At the 1985–86 rate, students choosing this plan would pay $7,990 for two semesters instead of $8,070.

Four-Year Prepaid Tuition Plan

New undergraduate students may elect to pay in advance the total tuition for their full four-year programs at the rate applicable to their first year. Under this plan, the payment for programs beginning with the 1985 fall semester would be $32,280. Refunds to students who do not complete their full four-year programs would be made at the original rate for all remaining full semesters.

Commercial Prepaid and Deferred Payment Plans

Several commercial programs for parents who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301
4. School-Chex, Irving Trust Company, P.O. Box 12231, Church Street Station, New York, N.Y. 10249

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs but will be happy to provide guidance to students and parents.

Off-Campus Courses

Fees for each semester are due and payable in full at the time of each registration; however, a student registering for a 13-week or longer credit course may sign a deferred payment contract at each registration to make payments in three equal installments—one-third at the time of registration, one-third by October 3, and one-third by November 3 (for the fall semester); one-third at the time of registration, one-third by February 7, and one-third by March 6 (for the spring semester). Payments are due at the stipulated times. Interest at the rate of 8 percent per annum on the unpaid balance will be charged from the beginning of each semester to the date payment is made.

Students receiving partial government tuition assistance, employee benefits, and partial scholarships must pay their portion of the tuition in full at the time of registration.

Except for specified special sessions, tuition and fees for credit courses lasting less than 13 weeks, and for all noncredit courses, are payable in full at registration.

Withdrawals and Refunds*

Applications for withdrawal from the University or for change in class schedule are made by completing the George Washington University Change Slip (obtainable in Tompkins Hall, Room 103), securing the approval of the appropriate faculty, and submitting the form to Tompkins Hall, Room 103, for the dean's signature. Notification to an instructor is not an acceptable notice (see Withdrawal, page 259.)

Withdrawal and Change in Course Status

Courses may be dropped by undergraduate and graduate students without academic penalty only during the 28 days following the first day of classes, with the approval of the instructor, the student's adviser, the department, and the dean. The dean's approval may be obtained in Tompkins Hall, Room 103.

The status of a course may not be changed from credit to audit or vice versa after the 28th day after classes have started for the semester. For other regulations governing withdrawal and changes in program, see pages 258–259. In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. **Complete withdrawal from the University:**
   Withdrawal dated on or before Friday of the first week of classes....90%
   Withdrawal dated on or before Friday of the third week of classes...75%
   Withdrawal dated on or before Friday of the fifth week of classes....50%
   Withdrawal dated after the fifth week of classes.....None
2. **Partial withdrawal:** If the change in program results in a lower tuition charge, the refund schedule above applies to the difference.
3. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.
4. **Summer sessions:** In cases of authorized withdrawals from courses, refunds of 75% of tuition and fees will be made for courses dropped within the first seven calendar days following the scheduled registration day. No refund will be made for courses dropped thereafter.
5. **Refund Schedule for Off-Campus Registration:**
   Long Session (or any session longer than 13 weeks)
   Starting date of class plus 6 calendar days.....90%
   Starting date of class plus 20 calendar days.....75%
   Starting date of class plus 34 calendar days.....50%
   Starting date of class plus 35 calendar days to end.....None

* Regulations concerning withdrawals and refunds for the summer sessions are stated in the *Summer Sessions Schedule of Classes*.

Intermediate Session (9 weeks, 1 day per week)
- Starting date of class plus 6 calendar days 90%
- Starting date of class plus 13 calendar days 75%
- Starting date of class plus 20 calendar days 50%
- Starting date of class plus 21 calendar days to end ..... None

Short Session (7 weeks, 2 days per week)
- Starting date of class plus 2 calendar days 90%
- Starting date of class plus 8 calendar days 75%
- Starting date of class plus 15 calendar days 50%
- Starting date of class plus 16 calendar days to end ..... None

Mini Session (3 weeks)
- Starting date of class plus 1 calendar day 90%
- Starting date of class plus 5 calendar days 75%
- Starting date of class plus 9 calendar days 50%
- Starting date of class plus 10 calendar days to end ..... None

No refund will be made for sessions of less than 21 days.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be refunded or reduced because of absence from classes. Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

Financial Aid

George Washington University offers a program of financial assistance for undergraduate and graduate students. Undergraduate aid consists of two basic types: awards for academic achievement without reference to financial circumstances (honor scholarships) and scholarships, grants, loans, and employment based on demonstrated financial need. Applicants may apply for only **one** type of aid: need-based or honor. The program of financial assistance for graduate students includes assistantships, fellowships, traineeships, graduate scholarships, research appointments, part-time employment, and loans. In addition, loans and resident assistantships not based on financial need are available to undergraduates and graduates alike. In general, consideration for financial aid is restricted to students in good academic standing who meet the minimum grade point average for particular awards and are not financially encumbered by any other University office. Information on the various programs is given below.

Scholarships and Other Forms of Aid for Undergraduates

Engineering Honor Scholarships (EHS)—Academic Merit Only

This program was initiated to recognize academically talented students who wish to study at the School of Engineering and Applied Science. The scholar-

ships are awarded on the basis of merit only and financial need is not a requirement for consideration. The EHS is available to entering freshmen and to transfer students who have (or will have by the time of entrance to SEAS) compiled 30 semester hours of college-level work that includes 6 semester hours of calculus or higher math and 3 semester hours of either physics or chemistry. The EHS is available to U.S. citizens or students with permanent visas.

These scholarships cover one-half the tuition costs of attending SEAS and will be awarded to qualified students for up to four years as long as scholarship criteria are met, with the option of a fifth year if the student wishes to obtain a master's degree. Applicants with financial need should apply for need-based aid, **not** for EHS.

All undergraduate students must file applications and supporting credentials by March 1 preceding the academic year of the award for the fall semester; by November 1 for the spring semester; and by April 1 for the summer sessions.* ***A student must reapply for the EHS each year.***

Minimum Criteria for Incoming Freshmen

The minimum criteria in the EHS Program are based on merit. The student must have:

1. achieved a minimum combined SAT score of 1250 or better, or if the SATs have not been taken, an average ACT score of 30 or better in the English/mathematics/natural science tests or a combined PSAT score of 125 or better;
2. ranked at the end of the junior year in the upper 10% of the class over a period of three years or more;
3. achieved an average grade of 85% or better at the end of the junior year in mathematics and science courses taken during the previous three years.

Minimum Criteria for Incoming Transfer Students

The minimum criteria in the EHS Program are based on merit. The student must have:

1. completed (or will have completed at the end of the present semester) 30 semester hours in an accredited community college, college, or university;
2. completed courses that must include at least 6 semester hours of college calculus or higher mathematics and at least 3 additional hours of college-level physics or chemistry;
3. achieved an overall quality-point index of at least 85% (3.4) and a combined average of 80% (3.2) in college-level mathematics and science courses.

Need-Based Financial Aid

The University offers extensive programs of scholarships, grants, loans, and employment based on demonstrated need. The University participates in the

* Summer sessions students are eligible for consideration only if they were enrolled in this University for at least 8 semester hours in the immediately preceding spring semester or have applied for financial aid for the following fall semester.

National Direct Student Loan, Pell Grant, Supplemental Educational Opportunity Grant, and the College Work-Study programs.

All undergraduate students must file applications and supporting credentials by March 1 preceding the academic year of the award for the fall semester; by November 1 for the spring semester; and by April 1 for the summer sessions.* ***A student must reapply for financial aid each year.***

Complete information concerning financial assistance is contained in the student financial aid pamphlet, which is available from the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

Scholarships and Grants

Scholarships are awarded for the academic year unless otherwise specified and are credited in equal parts for each semester. Each holder must carry at least 15 semester hours per semester in subjects related to the degree program during the period for which the scholarship is awarded. Most of the following scholarships are limited to students in the School of Engineering and Applied Science. The University also offers other scholarships that are open to engineering students.

Frederick Albert and Alma Hand Britten Scholarships (1959)—Bequest of Alma Hand Britten for scholarship assistance to students entering the School of Engineering and Applied Science who would not otherwise be able to pursue such professional study. Available for undergraduate and graduate study.

American Association of Cost Engineers Scholarship (1977)—Established by the American Association of Cost Engineers for scholarship assistance to a full-time student, graduate or undergraduate, majoring in a curriculum that includes courses related to cost engineering.

Atlantic Research Corporation Scholarship (1979)—Established by the Atlantic Research Corporation for both graduate and undergraduate students. The scholarship for undergraduates includes full tuition, books, and fees for students in their senior year only. Graduate students receive full tuition, books, and fees for one year of full-time graduate work. Recipients of the award must have an overall *B* average and must agree to accept employment with Atlantic Research Corporation for one year after graduation. Awards are offered on both a financial-need and a non-financial-need basis. See manager of engineering admissions for further details.

Henry Harding Carter Scholarship (1896)—Established by Maria M. Carter in memory of her husband to aid a deserving student who is preparing for the civil engineering profession. Available to students working toward the degree of Bachelor of Science (Civil Engineering).

Henry Parsons Erwin Scholarship (1955)—Established by Helen B. Erwin as a memorial to her husband, a former Trustee of the University. A partial scholarship for a student in Engineering and Applied Science.

The George Hyman Construction Company Scholarships (1974)—Established by the George Hyman Construction Company to aid deserving students preparing for the civil engineering profession. These partial tuition undergraduate scholarships begin in the fall semester and may be renewed through the senior year, provided the holder reapplies by the published deadlines.

* Summer sessions students are eligible for consideration only if they were enrolled in this University for at least 8 semester hours in the immediately preceding spring semester or have applied for financial aid for the following fall semester.

maintains a *B* average based on a full course load leading to a degree in civil engineering, and continues to be in financial need.

George Washington University Board of Trustees Scholarships—Full and partial tuition undergraduate scholarships that begin in the fall semester and may be renewed through the senior year, provided the holder reapplies by the published deadlines, maintains a *B* average, and continues to be in financial need. Candidates must plan to select a curriculum leading to a bachelor's degree.

Louis E. Giles Memorial Scholarships (1966)—Bequest of Susie E. Giles in honor and memory of her husband for scholarships to undergraduate and graduate students in the School of Engineering and Applied Science who need financial assistance.

National Action Council for Minority Engineers (NACME) Scholarship (1977)—Scholarship for minority students who require financial assistance of up to $2,500 and are in good academic standing. Minority students are defined as full-time students of Black, Puerto Rican, American Indian, or Chicano descent who are U.S. citizens or permanent residents and are entering an engineering school or university for the first time. (A non-need-based award of $500 may also be made to qualified minority students.)

Scholarships, Fellowships, Assistantships, and Other Forms of Aid for Graduate Students

Application and correspondence concerning assistantships, fellowships, traineeships, or graduate scholarships should be sent directly to the department concerned and addressed to George Washington University, Washington, D.C. 20052. Unless otherwise specified, application and supporting credentials should be submitted not later than February 1 preceding the academic year for which the award is made. Application for admission to graduate study is a prerequisite for consideration.

Graduate Scholarships and Fellowships

Abd Elfattah Abd Alla Award—Established in memory of Professor Abd Elfattah Abd Alla (1937–1984). Dr. Abd Alla served his profession as a professor and as Chairman of the Department of Electrical Engineering and Computer Science. The award is based on academic merit and is made to an incoming full-time graduate student in the Department of Electrical Engineering and Computer Science. Minimum academic criteria for and maintenance of the award is the same as for the Graduate Engineering Honors Fellowship (see below). The award consists of one-half tuition and a $6,000 stipend for an academic year and is renewable.

Achievement Rewards for College Scientists (ARCS) Foundation, Inc., Scholarship—Scholarship for outstanding students in the fields of science, engineering, and medicine.

Frederick Albert and Alma Hand Britten Scholarships (1959)—See p. 250.

Frederick Albert and Alma Hand Britten Scholarship (1977)—See p. 250.

American Association of Cost Engineers Scholarship (1966)—See above.

Louis E. Giles Memorial Scholarships (1966)—See above.

Graduate Engineering Honors Fellowship (GEHF) Program—Established to recognize and reward students who have achieved academic excel-

lence and are interested in starting or furthering graduate work. Students selected for the GEHF Program will receive the following: (1) a half-tuition scholarship for the first year of graduate study; (2) renewal of the half-tuition scholarship for (a) one additional year for master's and professional degree students or (b) two additional years for doctoral students provided that a minimum 3.4 cumulative grade-point average is maintained while a full-time (nine semester hours per semester) student. It should be noted that one grade of *F*, regardless of cumulative grade-point average, disqualifies the recipient from further scholarship assistance. Students must satisfy the following criteria to qualify for consideration in the GEHF Program: (1) be a U.S. citizen or a permanent resident of the U.S.; (2) fully meet current School of Engineering and Applied Science requirements for admission to the appropriate program; (3) have attained approximately a 3.5 grade-point average in the prior degree from an accredited college or university; consideration is given to the content of programs completed and the academic reputation of all previous post-secondary institutions at which study was undertaken; (4) provide three letters of recommendation from professors in the previous academic program. Selection is made by the dean of the School of Engineering and Applied Science. A limited number of these fellowships are available each year. Students in the GEHF Program must carry an academic workload of at least nine graduate semester hours per semester in the degree program in which they have been accepted. At least three months prior to the semester they wish to begin study, students should submit applications, transcripts, and letters of recommendation to the appropriate department chairman, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052.

National Science Foundation Graduate Fellowships—Fellowships providing tuition, fees, and stipends to students in programs leading to graduate degrees in the mathematical, physical, medical, biological, engineering, and social sciences and in the history and philosophy of science. Open to students who have been admitted to graduate status and who have completed less than one calendar year of graduate study. Applications should be made to the Fellowship Office, National Research Council, 2101 Constitution Avenue, N.W., Washington, D.C. 20418. Please contact the Fellowship Information Center in the Gelman Library for more details.

Phi Delta Gamma Scholarship Endowment Fund (1968)—Established by the Beta Chapter of Phi Delta Gamma (national fraternity for graduate women) for women graduate students.

Industrial Liaison Program Awards

The Department of Electrical Engineering and Computer Science, through its Industrial Liaison Program (ILP), offers additional support to supplement either an award or an assistantship.

Abd Elfattah Abd Alla Award (see p. 251).

ILP Supplement to the Graduate Engineering Honors Fellowship Program—These awards are distinguished graduate research fellowships awarded to new full-time graduate students and funded by the Industrial Liaison Program. They are normally awarded to recipients of Graduate Engineering Honors Fellowships. The award is $6,000 plus half-tuition remission per semester for one year. Fellowship recipients work with a faculty member on a research project. The award is renewable on the same basis as the Graduate Engineering Honors Fellowship.

ILP Distinguished Graduate Teaching and Research Assistantship—These are first-year-only awards for $4,200 to new students, typically in conjunction with a teaching assistantship. Students work with a faculty member. Normally, the student will take on a graduate research assistantship for subsequent years of study. The teaching assistantship may continue as long as the student meets scholarship requirements and performs satisfactorily as a teacher.

Richard E. Merwin Memorial Award—The Industrial Liaison Program funds the Richard E. Merwin Graduate Fellowship, awarded annually to an outstanding D.Sc. student in the Department of Electrical Engineering and Computer Science. Dr. Merwin (1922–1981) served his profession as a research professor in the department, as President of the IEEE Computer Society, as Editor of *IEEE Transactions on Computers*, and by working on ENIAC, this country's first electronic computer. This award is made to a full-time D.Sc. student, based on academic merit. The award is $3,000 for one year; recipients are not eligible for an additional award.

Assistantships

Research Assistantships in Engineering Administration—Available to graduate students in any engineering administration program. Research assistants are expected to work 20 hours a week conducting research in support of an established research program. Stipends range up to $8,500 depending on the status of the student and the tenure of the appointment (9–12 months). Further information and applications are available from the Chairman, Department of Engineering Administration.

Research Scholar Assistantships, GWU/NASA–Langley Program—See pages 50–51.

Government- and Industry-Sponsored Fellowships

Industrial Liaison Program—The Industrial Liaison Program (ILP) has been established to develop closer cooperation and communication between the Department of Electrical Engineering and Computer Science, its Institute for Information Science and Technology, and companies that depend upon the technological foundations represented by the department. A steering committee of Washington area industrial leaders has provided important guidance in founding the program, which is structured to meet the needs of both the department and industry. One way in which the program attempts to meet these needs is the awarding of ILP fellowships; see pages 252–253 for more information.

From time to time, individual companies have sponsored graduate fellowships in specific fields of interest. Some recent examples are the following.

Boeing-GWU Doctoral Fellowship—for study toward the doctorate in engineering administration or systems analysis and management; minimum stipend of $18,000 per year, consisting of a full tuition-and-fee grant from GWU, a $10,000 grant from Boeing, and a $2,000 graduate teaching assistantship in the Department of Engineering Administration; students must meet minimum requirements for the Graduate Engineering Honors Fellowship to be considered.

COMSAT Cooperative Fellowship Program—awarded to two graduate students in the field of satellite communications and related areas; participa-

tion in a cooperative research program under the direction of a faculty adviser, half-tuition scholarship and stipend of $10,500; students must meet minimum requirements for the Graduate Engineering Honors Fellowship to be considered.

National Bureau of Standards—awarded to two graduate students in the fields of robotics, computer graphics, industrial automation, or computer-integrated manufacturing; 20 hours of work per week during the academic year and full time during the summer; stipend of $12,000 per year; students must meet minimum requirements for the Graduate Engineering Honors Fellowship to be considered.

Other Sponsored Awards for Graduate Study

Information regarding awards sponsored by foundations, professional and learned societies, industries, and others that may be used in support of graduate study is available at the Graduate Fellowship Information Center, 2130 H St., N.W., Room 621D, for students enrolled at George Washington University. Information is also available on such distinguished programs as the Rhodes, Marshall, National Science Foundation, Fulbright, Luce, and Rotary International, as well as many others.

Since deadlines for application vary, qualified students should make inquiries well in advance of the year of planned graduate study.

Forms of Aid Available to Undergraduate and Graduate Students

Assistantships

Research Assistantships in Operations Research and Related Fields—Available to graduates and to undergraduates on the junior and senior levels in any school of the University. Research assistants are expected to work 20 hours a week conducting research in support of an established research program, in programming, or in conducting individual research on an approved research project. Stipends range up to $10,000, depending on the status of the student and the tenure of the appointment (9–12 months). Further information and applications are available from Director, Institute for Management Science and Engineering, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052.

Resident Assistantships (men and women)—Available to graduate students and seniors in any field of study who are interested in working with the student personnel program in University residence halls. Specific duties vary with the position but basically consist of counseling, advising student groups, and administration. Remuneration includes partial tuition and a furnished room for the academic year. All positions are part-time, and staff members are required to enroll as full-time students in degree-granting programs. Further information may be obtained from the Office of the Director of Housing and Residence Life.

Loan Funds

The following loan funds are available to undergraduate and graduate students. A separate application must be submitted for all loan programs. Applications for the National Direct Student Loan should be filed no later than

March 1 (all undergraduates) or April 1 (graduate students). Complete information is contained in the student financial aid pamphlet, which is available from the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

George F. Henigan Loan Fund (1975)
International Student Loan Fund (1967)
Joanne Jacobs Student Loan Fund (1974)
Jessie B. Martin Loan Fund (1967)
National Direct Student Loan Program
University Student Emergency Loan Fund

John Brewster Willis, Jr., Loan Fund in Mechanical Engineering—Established by Mrs. William L. Lane as a memorial to her nephew, John Brewster Willis, Jr. Available to Mechanical Engineering students (graduate or undergraduate) who are primarily interested in aeronautics.

Guaranteed Student Loan Program—George Washington University is an eligible participant in the Federally Insured/State Guaranteed Student Loan Program. Undergraduate students may apply for a maximum of $2,500 per year. Graduate students may apply for a maximum of $5,000 per year. Students who intend to use the loan for payment of tuition at registration should submit an application and all required supporting documents no later than June 1 for the fall semester or academic year and November 1 for the spring semester.

Parents Loan for Undergraduate Students/Graduate Students—George Washington University is also an eligible participant in the Parents Loan for Undergraduate Students Program (PLUS), sometimes referred to as the Auxiliary Loan to Assist Students. The interest rate on the loan is presently 12% but depends on the fluctuation of the interest rate on U.S. Treasury Bills. Repayment begins 60 days after the disbursement of the check. Parents of dependent undergraduate students may apply for up to $3,000 per year. Independent undergraduate students may apply for up to $2,500 per year under the PLUS and GSL programs combined. Graduate students may apply for up to $3,000 per year. Students who intend to use the loan for payment of tuition at registration should submit an application no later than June 1 for the fall semester or academic year and November 1 for the spring semester.

Student Employment

The University participates in the College Work-Study Program. Inquiries should be addressed to the Office of Student Financial Aid. In addition, the Career Services Center maintains a registry of both full-time and part-time positions available in the Washington area for undergraduate and graduate students.

After registration students may apply at the Career Services Center, Academic Center, 801 22nd Street, N.W., Suite T509, for interviews and referrals to positions for which they are qualified.

International Students

Undergraduate international students with proven financial need, but with no prior schooling in the United States, who have completed one semester of full-time work (15 hours) at this University with a *B* average are eligible to apply

for the Board of Trustees Scholarships. If before coming to this University, they have completed at least one year in a U.S. high school and have taken SAT tests, they may apply for financial assistance. Scholarships are awarded in the spring for the following academic year. See instructions for applying for undergraduate financial aid, pages 248–251.

Limited awards for graduate teaching assistantships and University fellowships are the responsibility of the chairman of the department or dean of the school in which the degree is to be earned. Work as a teaching fellow requires excellent knowledge of English, both spoken and written.

Long-term loan funds for undergraduate and graduate international students are limited in amount and are generally available only to those foreign-born persons who have established resident status in the United States through the Immigration and Naturalization Service.

Students who wish to study in the United States should have available sufficient funds to cover expenses for one full year before attempting to enter a college or university. The cost at this University for one academic year (September–May) is at a minimum approximately $15,000. This estimate includes room and board, tuition, books, clothes, and incidental expenses; no travel, holiday, or medical expenses are included. This amount also does not cover tuition or living expenses for the summer. Neither a letter of admission nor an IAP-66 or I-20 form (needed for student visa status) will be issued to any student who does not show documentation (bank statement, letter of scholarship, etc.) that indicates he or she has the required funds.

Veterans Benefits

The Veterans Benefits Office, located on the third floor of Rice Hall, 2121 Eye St., N.W., assists those students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any problems that may arise concerning their benefits. This office also processes certification of enrollment and attendance to the Veterans Administration so that educational allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the veterans counselor that sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and includes other information of general interest.

The Veterans Administration is at 941 North Capitol St., N.E., Washington, D.C. 20421.

Prizes

Norman B. Ames Memorial Award—Established by many friends of Professor Ames and awarded annually to a graduating senior of the School of Engineering and Applied Science who is nominated by fellow students as having made significant contributions to the students in the School of Engineering and Applied Science, to the School, and to the University. The student receives a cash award, which is presented at the Annual Commencement in May.

Martin Mahler Prize in Materials Testing—A one-year membership in the American Society for Testing Materials awarded to the upper-division or

graduate student in engineering who submits the best reports on tests in the materials laboratory course with preference given to prestressed concrete tests. The award is presented at the Annual Commencement in May.

Alfred Martin Freudenthal Prize—Established as a memorial to Professor Freudenthal by his wife, friends, students, and colleagues for his outstanding contributions to engineering education and awarded annually to the senior who graduates with the highest scholastic standing. To be eligible for this prize, the student must have completed at GWU at least one half the work required for his or her degree. The student receives a cash award, and his or her name is engraved on a plaque displayed in Tompkins Hall. The award is presented at the Dean's Honors Reception held during the spring semester.

Regulations

A student enrolled in the School of Engineering and Applied Science is required to conform to the following regulations.

A student who withdraws, is suspended, or for any other reason is not registered at the University for one semester or more may re-enter and continue work only under the regulations and requirements in force at the time of return.

If a student knowingly makes a false statement or conceals material information on an application for admission, registration card, or any other University document, the student's registration may be canceled. If such falsification is discovered after the student has established an academic record at the University, the student may be subject to dismissal from the University. Such a student will be ineligible for subsequent registration in the University except by special action of the faculty.

Academic Dishonesty

The University community, in order to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with and make use of all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and will be held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are legal, moral, and intellectual offenses against the community and will be prosecuted through the proper University channels.

Copies of the University policy on academic dishonesty can be obtained from the following officers: all department chairmen, all academic deans, the registrar, and the vice president for academic affairs.

Student Conduct

All students, upon enrolling and while attending the George Washington University, are subject to the provisions of the *Statement of Student Rights and*

Responsibilities, which outlines student freedoms and responsibilities of conduct, the Judicial System for Nonacademic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained from the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University, which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

Changes in Program of Study

A student may not make any changes in an approved program of study without the approval of the faculty adviser instructor, international student adviser (when appropriate), and the associate dean. Requests for changes in class registration must be made on a form provided in the School's Admissions Office.

Adding Courses

During the 14 days following the first day of classes of a semester, courses may be added to the student's program with the approval of the instructor, the faculty adviser, and the associate dean.

Dropping Courses

Regular Drop

Courses may be dropped by undergraduate and graduate students without academic penalty only during the 28 days following the first day of classes, with the approval of the instructor, the student's adviser, the department, and the associate dean.

Late Drop

Permission to drop any course without academic penalty after the 28th day following the first day of classes of a semester may be granted with the approval of the instructor, the student's adviser, the chairman of the department in which the student is enrolled, and the associate dean. Requests for late drops must be submitted to the associate dean's office on the appropriate late-drop form and must be accompanied by a change slip and certification of sickness or injury, if such is the cause of the late withdrawal. Late drops may be granted only under both of the following conditions:

1. It is necessary because of exceptional circumstances such as certified medical absence or forced absence caused by work-related requirements.
2. The grades in all courses involved are *C* or better for graduate students and *D* or better for undergraduate students as of the date of the request.

In all cases, financial regulations governing withdrawal remain in full effect.

Change in Course Status

The status of a course may not be changed from credit to audit or vice versa after the 28th day after classes have started for the semester.

Full tuition is charged for courses dropped without the approval of the associate dean. Such unauthorized withdrawal will result in the recording of a grade of Z (see pp. 21–22 and 35–36) for the course or courses. Permission to withdraw from the University will not be granted to a student who does not have a clear financial record.

Withdrawal

A student who withdraws or is otherwise absent from the University for one semester or more must apply for readmission. If readmitted, the student continues work under the requirements and regulations in force at the time of readmission.

Applications for withdrawal from the University or for changes in class scheduling must be made on a Course Drop/Add Request Form. The signatures of the course instructor(s), student's adviser, department chairman, and, where appropriate, the international services adviser must be obtained on the form prior to receiving the dean's approval.

Credit

Credit is given only after registration for a course and satisfactory completion of the required work or upon the granting of advanced standing.

Auditing

A person who has been admitted to the University may be registered, with the permission of the instructor, as an auditor in a class (no academic credit). An auditor is not required to take active part or to pass examinations. A student who takes a course as an auditor may not repeat it later for credit.

Balance Sheet

On request the School's Admissions Office will issue to undergraduate degree candidates a balance sheet showing the amount of work completed and the requirements remaining to be met for the degree. A second balance sheet is issued only if the student changes major or degree objectives. It is recommended that a balance sheet be requested at the completion of the junior year.

Postadmission Transfer Credit

A student who plans to attend another institution not in the Consortium and apply credit so earned toward graduation from this University must first secure the written approval of the adviser, the department chairman, and the associate dean on a form available in Tompkins Hall, Room 103. (Students wishing to take courses in Consortium schools should complete this form, but must also follow procedures as outlined on page 243.) In no event will credit in excess of what might be earned in a similar period in this University be recognized.

Transcripts of Record

Official transcripts of student records are issued on written request of the student or former student who has paid all charges, including any student loan

installments, due the University at the time of the request. A fee of $2 is charged for each transcript. When more than two transcripts are ordered at the same time, a $2 fee is charged for each of the first two transcripts and a $.50 fee is charged for each additional transcript. Partial transcripts are not issued.

Graduation Requirements

To be recommended by the faculty for graduation, a student must have met the admission requirements of the School; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which he or she is registered; and be free from all indebtedness to the University. Registration is required for the semester or summer session at the close of which the degree is to be conferred.

Application for Graduation—An Application for Graduation form must be filed and the appropriate fee paid at the time of registration for the last semester or summer session of the senior or final year. Students completing degree requirements during the summer sessions will be awarded diplomas (no formal convocation) dated September 30, provided they have completed all degree requirements and have applied for graduation as a part of registration for the summer sessions.

Attendance and Conduct—The University reserves the right to refuse to confer a degree upon a candidate whose attendance or conduct has been unsatisfactory.

Student Records—Information on the status of credit, transfer-of-credit awards, balance sheets, and other information relating to graduation may be obtained in Tompkins Hall, Room 103.

Area of Concentration Certificate—Upon successful completion of the master's degree the student, by means of a written request to the appropriate department chairman, may obtain a certificate indicating the area of concentration.

The Library

All students registered in the University have the privilege of using the Melvin Gelman Library. Its stacks are open, and all students are welcome to browse. A card denoting approved enrollment for the current semester must be presented when books are borrowed for outside use.

The loan period for stack books is 21 days. Any book that circulates is subject to recall by the library if needed for reserve or other use. Reserve books must be used in the reserve reading room when the library is open; they may be withdrawn for overnight use beginning at 8:30 p.m. Transcripts of grades are withheld until a student's library record is clear, with all borrowed books returned and any fines paid.

All students using the Gelman Library are expected to be familiar with its detailed regulations, available at any of the library's service desks.

University Policy on the Release of Student Information

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions that are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must:

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. receive the student's written consent before releasing information from his or her education records to persons outside the University, except as provided by the Act and except for directory information as indicated below. Information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and
4. comply with a judicial order or a lawfully issued subpoena to release a student's record, notifying the student of such action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height and weight of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar at the beginning of each semester.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

Right to Dismiss Students

The right is reserved by the University to dismiss or exclude any student from the University or from any class or classes whenever, in the interest of the student or the University, the University administration deems it advisable.

Right to Change Rules

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

Right to Make Changes in Programs

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

Property Responsibility

The University is not responsible for the loss of personal property. A Lost and Found Office is located on campus in the Safety and Security Office.

University Policy on Drugs

The University cannot condone violations of law, including violations of those laws that proscribe possession, use, sale, or distribution of drugs. Members of

the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken to protect the interests of the University and the rights of others.

Associations and Services

Consortium of Universities of the Washington Metropolitan Area, Inc.

Seven universities in the Washington area (American University, Catholic University of America, George Washington University, Georgetown University, Howard University, the University of the District of Columbia, and the University of Maryland) are associated in a Consortium through which they coordinate the use of their respective facilities; Gallaudet College, Mount Vernon College, and Trinity College are associate members of the Consortium. Students in approved programs leading to degrees in any one of these institutions have the opportunity to select from the combined offerings of all of the members the particular courses that best meet their needs.

Participation is limited to campus degree candidates. The following, however, are excluded: students in canon law, dentistry, medicine, and theology. Law students are also excluded from participation, except for candidates for the degree of Master of Laws at George Washington University and Georgetown University.

In special courses involving private instruction (as in music or art) or tutorial study, if a special fee is charged, this fee is not covered by the Consortium agreement and must be paid by the individual student to the institution administering the course.

Students are encouraged to study the program announcements of all participating institutions. See page 243 for more information concerning registration for Consortium courses.

Registration forms and instructions are available from the registrar and in Tompkins Hall, Room 103. Students register and pay tuition at their own institutions for Consortium courses; course fees are payable to the visited institutions.

Center for Academic and Administrative Computing

The Center for Academic and Administrative Computing (CAAC) is located in the Academic Center, 801 22nd St., N.W. CAAC facilities are normally available 24 hours a day during the academic year, to all faculty, staff, and students.

CAAC encourages interest in computers by providing computing facilities and by offering short courses and technical assistance. Any University student may have access to the computer facilities for individual research, class projects, and thesis or dissertation study. Access is by request; the schedule of charges is available at CAAC.

CAAC maintains an IBM 4381 and two IBM 4341s (VM/SP and OS/VS1). A full range of compilers and application software packages is available, including (but not limited to) CMS, XEDIT, FORTRAN, COBOL, PL/1, PASCAL, APL, SPSS, SAS, BMDP, ASSEMBLER, ASSIST, and SCRIPT. In addition, CAAC provides a variety of public terminals and microcomputers.

Various departments and schools of the University offer computer programming courses as well as courses that use the computer as a research adjunct to academic work. In general, additional fees are charged for computer use.

Speech and Hearing Center

The Speech and Hearing Center offers diagnostic and remedial work for children and adults with such communication difficulties as stuttering, lisping, cleft-palate speech, and cerebral-palsied speech and with voice, articulatory, and hearing problems. Diagnostic and remedial work is also available for persons with nonstandard language usage due to such conditions as hearing loss, brain damage, mental retardation, and environmental factors.

Reading Center

The Reading Center offers individual diagnostic and corrective services for all levels: primary, elementary, secondary, and adult. In addition, special reading improvement classes are conducted for high school students, college students, and other adults.

A complete diagnosis includes psychological tests; vision, hearing, dominance, and spelling tests; and various types of reading achievement and aptitude tests. Results are interpreted, and a written report is presented in conference with the parents or the individual.

The special reading improvement classes for high school students, college students, and other adults are offered throughout the year at stated intervals. Emphasis is placed on improvement of vocabulary, speed, comprehension, and study skills. Instruction in spelling is also provided as needed.

Fees—Individuals should contact the Center regarding the fee schedule. All fees are payable in advance at the Reading Center, Building C, Suite 429, 2201 G Street, N.W.

The Writing Laboratory

The Writing Laboratory, a University facility administered by the English Department and Columbian College, offers a free tutorial service to George Washington University students who need help with basic writing skills and with writing projects ranging from compositions and research papers to résumés, applications, and business letters. The Lab also offers a series of mini-courses on grammar, diction, style, the taking of essay exams, and a variety of other subjects. The Writing Laboratory is located in Stuart Hall, Room 201A.

ROTC

George Washington University students may enroll through the Consortium in the Army ROTC program offered at Georgetown University, the AFROTC program at the University of Maryland, or the Army ROTC or AFROTC at Howard University. Those interested should contact the ROTC enrollment officer at one of these universities. Credit for such courses may be transferable to George Washington University; prior approval is required by the dean of the school in which the student is enrolled.

For information on the George Washington University Naval Reserve Officer Training Corps Program, see pages 52–54.

Alumni Associations

General Alumni Association

The objectives of this Association are to unite graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes and to promote the general welfare of the University.

Membership in the Association is conveyed automatically to anyone who has been graduated from any school or division of the University. Anyone who has earned 15 semester hours or the equivalent at the University and whose class has been graduated is eligible for membership. For Division of Continuing Education and Summer Sessions students, however, only the "15 semester hours earned" requirement, not the "graduation of the class" requirement applies. Any persons who are members of the University's Board of Trustees, faculty, or administrative staff, as well as anyone else determined to qualify by the Governing Board, are eligible for membership.

The affairs of the Association are directed by a Governing Board, the majority of whose members represent the constituent alumni of the University's schools and colleges.

The voluntary leadership of the Association works closely with the staff of the Alumni Relations Office in carrying out Association affairs. The Association may be contacted through the Alumni Relations Office.

All alumni are urged to keep the Alumni Relations Office informed of changes of address or occupation and to supply information with regard to their fellow alumni. The Office is located in Alumni House, 714 21st St., N.W., George Washington University, Washington, D.C. 20052.

Engineer Alumni Association of the George Washington University, Inc.

The Association was organized in 1936 and incorporated in 1963 to coordinate with the General Alumni Association those activities of primary interest to engineering alumni. The objectives of the Association are to provide the link between the graduates and faculty of the School, to help promote the general welfare of the School of Engineering and Applied Science and of the University, to foster activities of the engineering organizations recognized by the University, and to advance the engineering profession in general.

In 1966 a board of directors, comprised of 15 elected members of the Association and the Engineers' representatives serving on the Governing Board of the General Alumni Association, was established. The membership of the board of directors was expanded in 1969 to include the Director of Alumni Relations and one representative each from the faculty of the School and the student body. Members of the Association are elected each year, prior to the June meeting, to three-year board memberships as listed at the top of page 265.

Term Expiring 1985
Wesley G. Harris
Richard Hu
Michael Hubbard
Mary O. Jones
Diego Roque

Term Expiring 1986
Robert Dickey, Jr.
An Thanh Le
Cleveland Watkins

Term Expiring 1987
Frank F. Atwood
Nahid Khozeimeh
Dudley J. Schwartz
James A. Sinsabaugh
Edwin Stengard

General Alumni Association Representatives
Pastor Farinas
Mary O. Jones
Issa Khozeimeh
John R. Manning
Eric S. Mendelsohn

Student Representative
Ayman Jumean
Faculty Representative
Galip M. Arkilic

At the June meeting each year, the board elects officers for its operation during the upcoming year. Following are the officers for 1984–85:

President: Mary O. Jones, M.S. 1976; 1818 North Cleveland Street, Arlington, Virginia 22201
Vice President: Dudley J. Schwartz, M.S. 1973; 14132 Flint Rock Road, Rockville, Maryland 20853
Secretary: Robert Dickey, Jr., B.S. (E.E.) 1976; 8200 Matthew Court, Upper Marlboro, Maryland 20870
Treasurer: Nahid Khozeimeh, M.S. 1976; 7005 Milwood Road, Bethesda, Maryland 20817



Student Life

The Office of the Vice President for Student and Alumni Affairs develops student life services, policies, and procedures to complement the University's formal instruction program. These activities are implemented through the offices of the Cloyd Heck Marvin Center, Counseling Center, Dean of Students, Educational Opportunity Program, Housing and Residence Life, International Student Services, Disabled Student Services, Student Activities, Career Services Center, and Student Health Service.

Student Services

Office of the Dean of Students

The Office of the Dean of Students provides counseling and information for students and assists in program development for the Division of Student Affairs. Staff members are well informed on University policies and the various student services provided on campus, enabling them to provide referrals and answers to many questions concerning general student life. Personal letters of recommendation for students applying to graduate and professional schools can be obtained from this office. The dean of students is responsible for the services and programs offered by the Counseling Center Educational Opportunity Program, International Services, Services for Students with Disabilities, Student Health Service, and Career Services Center.

Disabled Student Services

The director of Disabled Student Services works to assure that the special services necessary for handicapped students to participate fully in their academic programs and the extracurricular life of the campus are provided for them through University or community resources.

Housing and Residence Life

Complete information concerning the University's residence halls is available from the Director of Housing and Residence Life, George Washington University, Washington, D.C. 20052. Information concerning off-campus housing near the University may also be obtained at this office.

Admission to the University does not include a room reservation. The student will receive, with his or her notification of acceptance, University residence hall information, an application for residence hall space or apartment accommodation, and a declaration of intent to attend the University. The application for residence hall space or apartment accommodation must be accompanied by a $200 ***nonrefundable deposit.*** The housing deposit is credited toward the first semester's room or apartment charge. Rooms and apartments are leased for the academic year, and lease payment must be made in early June for the fall semester, unless the student elects the deferred payment plan

or the 10-month payment plan. Please check with Housing and Residence Life for the deferred payment plan and with the Student Accounts Office for the 10-month payment plan.

1985-86 Residence Hall Rates per Person for Two Semesters*

For Men

Calhoun Hall	
double room	$2,530
triple room	2,450

For Women

Strong Hall	
single room	2,730
double room	2,530
triple room	2,450

For Men and Women

Crawford Hall	
double room	2,530
Everglades Hall‡	
triple room	2,530
Guthridge Hall‡ (limited to juniors and seniors)	
apartment for one person	2,920 or 2,850
apartment for two persons	2,800
apartment for three persons	2,550
Building JJ (limited to sophomores, juniors, and seniors)	
apartment for two persons	2,670
apartment for four persons	2,670
apartment for six persons	2,450
Francis Scott Key Hall (limited to juniors and seniors)	
apartment for one person	2,920
apartment for two or three persons	2,800
Madison Hall	
double room	2,530
triple room	2,450
Milton Hall†‡ (limited to juniors and seniors)	
apartment for two persons	2,700
apartment for three persons	2,550
Mitchell Hall	
single room	2,730
Munson Hall†‡ (limited to juniors and seniors)	
apartment for two persons	2,700
apartment for three persons	2,550
Thurston Hall	
double room, triple room, room for four or five	2,530

* Residence hall prices and allocation subject to change.
† Residents must pay electricity bills (which do not include the cost of heating) in addition to the stated rate.
‡ Residents must deal directly with the telephone company and pay all costs associated with telephone service.

Food Service*

Resident freshmen and sophomores are required to choose one of the following three food service plans. The seven-day, 19 meals per week plan at $1,830 for the academic year, the any 14 meals per week plan at $1,762 for the academic year, the any 10 meals per week plan at $1,714 for the academic year, or the any 7 meals per week plan at $1,682 for the academic year. Participation in the food service plans is optional for junior, senior, and graduate students and for all students assigned to apartments. Food service payment does not cover University intersession or vacation periods. All meal cards admit bearer to dining rooms in Thurston and Mitchell Halls and to the second-floor contract dining room in the Cloyd Heck Marvin Center. Meal cards may also be used on a cash equivalency basis in the Marvin Center first-floor cafeteria and George's Rathskellar.

Students who observe the Jewish dietary laws can write to make arrangements with the George Washington University Housing and Residence Life Office regarding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

Educational Opportunity Program

The Educational Opportunity Program (EOP) provides selected District of Columbia residents with financial aid, academic support services, and personal advising to assist them in pursuing undergraduate work at George Washington University. The EOP staff coordinates a precollege program as well as educational and cultural activities to promote the success and enhance the experience of program participants.

The EOP staff administers the High School/College Internship Program (HI/SCIP), which enrolls highly motivated District of Columbia high school seniors. Participants enroll at GWU as nondegree candidates, taking a maximum of 6 credit hours per semester in addition to their high school curriculum. Application to the HI/SCIP program is made through the student's high school guidance office. Counseling and advising is provided by the EOP staff. HI/SCIP students have access to all of the academic support services available to EOP participants. The Educational Opportunity Program is located at 2127 G St., N.W., Room 101.

Cloyd Heck Marvin Center

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board, by the academic departments that include performing arts, and by other student and faculty organizations.

The Center Governing Board, representative of all segments of the University community, plays an important role in the functioning of the Center by working closely with the full-time staff in the development of procedures and policies that provide a framework for the Center's operation.

* Food service prices subject to change.

Student Health Service

The Student Health Service is an outpatient clinic located in the H.B. Burns Memorial Building at 908 New Hampshire Ave., N.W.

The Health Service is staffed by physicians, nurse practitioners, and physician assistants who are capable of addressing most of the students' medical problems. Visits are cost-free and may either be arranged by appointment or, during certain hours, be secured on a walk-in basis. Many routine laboratory tests may be performed in the Health Service lab at cost. Allergy shots, immunizations, and various lab tests are done at little or no charge. Psychiatric evaluation, crisis intervention, and short-term therapy are available by appointment.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. All fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students enrolled in off-campus programs and the Continuing Engineering Education Program are not eligible. The bills incurred from all services rendered outside of the Student Health Service (for example, x-ray work, laboratory work, and office visits to private physicians) are the responsibility of the student.

Health and Accident Insurance

The University has arranged for and endorsed group health and accident insurance, on an elective basis, for all students. Interested students should consult the Student Health Service or the Office of the Dean of Students.

Counseling Center

The Counseling Center fosters personal growth and development and helps individuals with personal, social, career, and study problems that interfere with their educational goals. University students, staff, and faculty are eligible for services. These include (1) short-term individual counseling, psychotherapy, and art therapy for personal problems (e.g., academic pressures, relationship issues, family problems, concerns about sex, self-esteem); (2) group counseling for personal problems and special focus problems; (3) educational/vocational counseling and assessment to facilitate choices of majors and careers; (4) workshops designed to facilitate students' learning about themselves and developing new ways of interacting with others (e.g., assertiveness training, stress management, relationship skills, and study skills seminars); (5) consultation with faculty, staff, and student groups about their special needs in designing programs to improve the campus environment.

The Center administers the Miller Analogies Test, GWU admissions tests, and special assessments for business and industry. Its Community Vocational Counseling Services provides educational/vocational counseling to GWU alumni and the greater Washington community.

Students, staff, and faculty may schedule a cost-free initial interview from 9 a.m. to 4:30 p.m., Monday through Thursday, and from 1 to 4:30 p.m. on Fridays. For most services a modest fee per appointment is charged. An additional materials fee is charged for test batteries. Fee adjustments can be made if financial need is a factor. Disabled students are asked to call ahead so

that arrangements can be made to adapt services or to meet at an accessible site. The Counseling Center is located at 718 21st St., N.W.

International Student Services

Located in the International House at 2129 G St., N.W., the staff of International Student Services provides advising and counseling in matters of personal and academic concern and visa regulations. This office is also a consultation, information, and resource center for the University's international population.

Career Services Center

The Career Services Center provides career planning and job-seeking assistance to students and alumni. Programs and services include full-time and part-time job vacancy listings; career counseling; workshops (e.g., organizing job searches, resume and letter writing, effective interviewing, negotiating for salary); a resource library of career field and employer literature; on-campus interviews for students within one year of graduation; a resume referral service; resume critiques; a call-in job listings service, Jobline; and a credentials service that supports employment and graduate/professional school applications. The Center is located in the Academic Center, Suite T-509, 801 22nd St., N.W.

Religious Life

The University recognizes the contribution that religion makes to the life of its students and encourages them to participate in the various religious organizations of their own choice. Catholic, Jewish, and Protestant bodies sponsor various groups and form a link between the University and the religious community. The advisers of the religious organizations are available for counseling. Religious services and special observances are also provided for the University community as announced.

Davis-Hodgkins House

The Davis-Hodgkins House is the student center of the School of Engineering and Applied Science, providing lounges, reading rooms, and student organization offices. The House, at 2142 G Street, N.W., provides convenient, comfortable facilities for the exchange of ideas and good fellowship.

Student Activities

The offices of the Vice President for Student Affairs, the Dean of Students, the Director of the Cloyd Heck Marvin Center, and the Director of Student Activities are responsible for all cocurricular phases of student life.

Student Activities Office

The Student Activities Office assists individual students and organizations in program development, campus leadership training, and participation in special projects, both within the University community and the community at large. The Office serves as a clearinghouse for activity information, registers and advises student organizations, and informs the University community of

activities and programs through monthly and annual publications. The Student Activities Office is also responsible for coordinating the orientation program for new students and for planning supplemental development programs for graduate and undergraduate students. Students who want to participate in the extracurricular phases of University life should acquaint themselves with the facilities and staff of the Student Activities Office.

Additional information about the numerous student organizations and committees is contained in the *Student Handbook*, compiled by and available from the Student Activities Office in the Marvin Center.

Student Government

The George Washington University Student Association is comprised of all full-time and part-time graduate, professional, and undergraduate students who are registered for academic credit on campus. A body of elected and appointed individuals is responsible for representing the interests of students at the University. The Student Association provides various services for students, such as an academic evaluation, a student directory, and the Student Advocate Service. Further information can be obtained from the Student Association offices in the Marvin Center.

Student involvement in the governance of the University is also possible through participation in various administrative and Faculty Senate committees, advisory councils of the schools and colleges, selected committees of the Board of Trustees, and specialized bodies such as the Residence Hall Association, the Joint Food Services Board, and the Marvin Center Governing Board. This involvement has helped develop policies and programs beneficial to students and the total University community.

The Engineers' Council

The Engineers' Council is the student governing body for the School of Engineering and Applied Science, composed of elected representatives from each class, the graduate student body, and each student organization in the School and the House Manager of the Davis-Hodgkins House. The purpose of the Council is to provide liaison between the student body of the School and the faculty, administration, and student government of the University in all matters affecting the general interests and welfare of the student body, the School, or the University. The Council is maintained financially by the Engineers' Council fee paid by each student in the School and sponsors the Engineers' Mixers and the Engineers' Ball. Council meetings are open to all students in the School.

Student Organizations

Students are encouraged to become involved with existing student organizations or to initiate their own. There are approximately 200 organizations on campus concerning a broad spectrum of interests: academic, professional, honorary, international, cultural, political interest, service, special interest, sports, hobbies and recreation, religious and meditative, and social fraternities and sororities. More complete information about these organizations can be obtained through the Student Activities Office.

The following are of particular interest to students in the School of Engineering and Applied Science.

Honor Societies

Delta Sigma Rho-Tau Kappa Alpha—A national forensic society.

Eta Kappa Nu (Theta Iota Chapter)—A national electrical engineering honor society established to recognize scholarship, character, and service.

Mortar Board—A national society for juniors and seniors, stressing leadership, scholarship, and service.

Omega Rho—A national operations research honor society established to recognize outstanding scholarship, character, and service.

Omicron Delta Kappa—A national society emphasizing leadership in extracurricular activities.

Phi Eta Sigma—A national society established to encourage and reward high scholarship and attainment; limited to those freshmen who attain a scholastic average of at least 3.50 or the equivalent.

Pi Tau Sigma—A national honorary mechanical engineering fraternity. Candidates are selected from the junior and senior classes on the basis of sound engineering ability, scholarship, and personality.

Sigma Xi—A national scientific honor society whose purpose is to encourage original investigation in pure and applied science. Outstanding graduate students in the sciences are eligible for full membership, and undergraduates who have shown marked ability in research may be elected to associate membership.

Tau Beta Pi—A national engineering honorary fraternity whose purpose is to recognize distinguished scholarship and exemplary character.

Professional Organizations

American Society of Civil Engineers (Student Chapter)

American Society of Mechanical Engineers (Student Chapter)

Institute of Electrical and Electronic Engineers (Student Chapter)

Theta Tau (Gamma Beta Chapter)—A national professional (engineering) fraternity. Membership is by invitation to outstanding students who have successfully completed at least the first year in the School of Engineering and Applied Science.

Athletics, Intramural Sports, and Recreation

The Charles E. Smith Center for Physical Education and Athletics offers many facilities for student use, including courts for basketball, volleyball, and badminton; a jogging track; a swimming pool; wrestling, gymnastic, and weight rooms; handball and squash courts; a sauna; and lockers. Based in the Smith Center, the men's and women's athletic departments offer a broad program of intramural and recreational activities designed to accommodate various levels of skill, experience, and interest.

The University is a member of the National Collegiate Athletic Association and the Atlantic Ten Conference. Its varsity teams compete against major universities throughout the Midwest and Eastern Seaboard in such sports as basketball, baseball, soccer, tennis, golf, wrestling, crew, swimming and diving, squash, badminton, volleyball, and gymnastics.

Major Program Events

Art Exhibits—The work of locally, nationally, and internationally known artists is shown in monthly exhibits in the Dimock Gallery in Lisner Auditorium and in the art gallery of the Cloyd Heck Marvin Center. With the cooperation of the curator of art, an annual student art exhibit is presented.

Concert Series—The Department of Music presents a series of concerts featuring faculty, guest, and student artists throughout each year.

Dance—The GWU Dance Company presents major concerts, informal studio performances, experimental events, television appearances, and lecture-demonstrations. Students may audition to become company members and have the opportunity to choreograph, perform, and gain experience in the technical aspects of dance productions.

International Programs—The International Student Society presents an annual International Dinner in cooperation with foreign embassies and international restaurants. Other programs include regular forums and speakers on international topics.

Orchestra and Chorus Concert Series—The University Orchestra and Chorus are two facets of the lively arts available to students either as credit courses or as extracurricular activities. The Chorus presents major performances to the University community three or four times a year, including regular winter and spring concerts. The University Orchestra presents several performances annually.

Program Board—The University Program Board, composed chiefly of elected and appointed students, is given primary responsibility and resources for student programming on campus. Through its various committees and in cooperation with other campus groups, it regularly sponsors films, lectures, concerts, social activities, and special events.

Theater—The University Theater produces four or five major plays and musicals during the year on the proscenium/thrust stage in the Dorothy Betts Marvin Theatre or in Lisner Auditorium. Additional works, including original and experimental plays, are produced in a more intimate studio theater. Students have the opportunity to participate in all aspects of theater and may receive credit toward their B.A. or M.F.A. degrees for some of their production work.



The University

History and Organization

The George Washington University had its beginning in 1821 as the Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to the George Washington University. The debt of the University to George Washington, whose name it bears, is large but intangible.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a national university in the federal city. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice and the theory of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of the Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment Congress granted a charter, which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "that persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets and extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian

University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half-century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area is not without its reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street; the first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the pastor of a church at Nineteenth and Eye Streets; and Washington had selected Twenty-third and E Streets as the site of the national university he hoped to see established.

The University as it is now organized consists of the Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center and the Schools of Medicine and Health Sciences, Engineering and Applied Science, Education and Human Development, Government and Business Administration, and Public and International Affairs; and the Division of Continuing Education and Summer Sessions.

The George Washington University is privately endowed. It is governed by a Board of Trustees of which the University President is an *ex officio* member.

University Libraries

The library collections of the University are housed in the Melvin Gelman Library (the general library of the University) and in the libraries of the National Law Center and the School of Medicine and Health Sciences.

These collections contain approximately 1,390,000 volumes, to which are added some 60,000 volumes a year. Endowments supplementing the University appropriation provide research materials in the fields of American civilization, American literature, art history, foreign service, history, labor relations, public finance, the social sciences, and transportation. Gifts from many sources have enriched the collections, including a large National Endowment for the Humanities grant to strengthen the University's humanities holdings. The libraries currently receive about 14,000 serials.

Information concerning the use of the libraries may be obtained at library service desks. Individual and class instruction in the use of the library and orientation to library facilities are given by librarians upon request.

The library strives to fulfill the curricular, research, and recreational needs and interests of the students. Through computerized searches of bibliographic databases, the reference staff identifies and locates desired research materials not easily found through more traditional methods. The staff assists all members of the University in using the rich resources of the Washington area and the unusual opportunities they offer for extensive research.

Graduate degree candidates at George Washington University may, upon application, be issued a Consortium library card that permits direct borrowing from the main campus libraries of most other academic institutions in the Washington area. Graduate students may also obtain books and journal articles on interlibrary loan from other libraries in the city, throughout the United States, and in various other countries.

Board of Trustees of the University

The University is privately endowed and is governed by a Board of Trustees of which the President of the University is an ex *officio* member.

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School of Engineering and Applied Science Faculty and Staff of Instruction

Emeritus

Benjamin Carpenter Cruickshanks, *Professor Emeritus of Mechanical Engineering*
B.S. in M.E. 1920, George Washington University

Joseph Foa, *Professor Emeritus of Engineering and Applied Science*
Ir. Ing. (M.E.) 1931, Polytechnic Institute of Torino, Italy; Dr.Ing. (A.E.) 1933, University of Rome

Kenneth Johnson, *Professor Emeritus of Engineering Administration*
B.A. 1931, Indiana State University; Ph.D. 1937, Purdue University

Herbert Ernest Smith, *Professor Emeritus of Engineering Administration*
B.S. 1930, C.E. 1932, City University of New York, City College; M.S. 1936, Ph.D. 1940, New York University

Carl Hugo Walther, *Professor Emeritus of Engineering and Applied Science*
B.E. 1931, M.C.E. 1933, Johns Hopkins University; Ph.D. 1967, University of Maryland

Shao Wen Yuan, *Professor Emeritus of Engineering and Applied Science*
B.S. 1936, University of Michigan; M.S. 1937, Ph.D. 1941, California Institute of Technology; Ae.E. 1939, Stanford University

Active

Edward Abramic, *Lecturer in Engineering*
B.S.Ed. 1959, Belleville College; B.S.E.E. 1962, University of Missouri; M.S.E.E. 1970, Illinois Institute of Technology

Julian Gordon Adler, *Professorial Lecturer in Engineering*
B.S.E. 1960, University of Michigan

Joseph Morris Aein, *Professorial Lecturer in Engineering*
B.S. in E.E. 1958, Massachusetts Institute of Technology; M.S. in E.E. 1958, Ph.D. 1962, Purdue University

Charles Alexander, Jr., *Professorial Lecturer in Engineering*
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Facts About
The George Washington University

General Information	Private, nonsectarian, coeducational, founded 1821
Location	Washington, D.C., bounded by Pennsylvania Avenue and 19th, F, and 24th Streets, N.W.
Number of On-Campus Students	9,210 full-time, 8,049 part-time
Geographical Origin of Students	50 states, District of Columbia, 120 countries
Number of Full-Time Faculty	1,099 (89% with doctoral degrees)
Number of Part-Time Faculty	575 (includes some of the most distinguished men and women in Washington)
Room and Board	Cost varies from approximately $4,170 to $4,760 for the academic year (see pages 267–268)

Undergraduate majors: Accountancy, American Civilization, American Literature, Anthropology, Applied Mathematics, Art History, Biology, Botany, Business Administration, Cartography, Chemistry, Chinese Language and Literature, Civil Engineering, Classical Archaeology and Anthropology, Classical Archaeology and Classics, Classical Humanities, Computer and Information Systems, Computer Science, Criminal Justice, Dance as a Performing Art, Dance Education, Dance Therapy, Early Modern European Studies, East Asian Studies (China or Japan), Economics, Electrical Engineering, Elementary Education, Elementary/Secondary Physical Education, English Literature, Environmental Studies, Exercise and Sport, Fine Arts, French Language and Literature, Geography, Geology, Germanic Languages and Literatures, History, Human Services, International Affairs, Journalism, Judaic Studies, Latin American Studies, Liberal Arts, Literature in English, Mathematics, Mechanical Engineering, Medical Record Administration, Medical Technology, Middle Eastern Studies, Music, Nurse Practitioner, Nursing Anesthesia, Operations Research and Computational Science, Philosophy, Physician Assistant, Physics, Political Communications, Political Science, Psychology, Public Affairs, Radio–Television, Radiologic Sciences and Administration, Religion, Russian Language and Literature, Russian Literature and Culture—in Translation, Secondary Education, Sociology, Spanish-American Literature, Spanish Language and Literature, Special Education, Speech Communication, Speech–Language Pathology and Audiology, Statistics, Systems Analysis and Engineering, Theatre, Travel and Tourism, Urban Affairs, Zoology

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Graduate School of Arts and Sciences, 1893

School of Medicine and Health Sciences, 1825

National Law Center, 1865

School of Engineering and Applied Science, 1884

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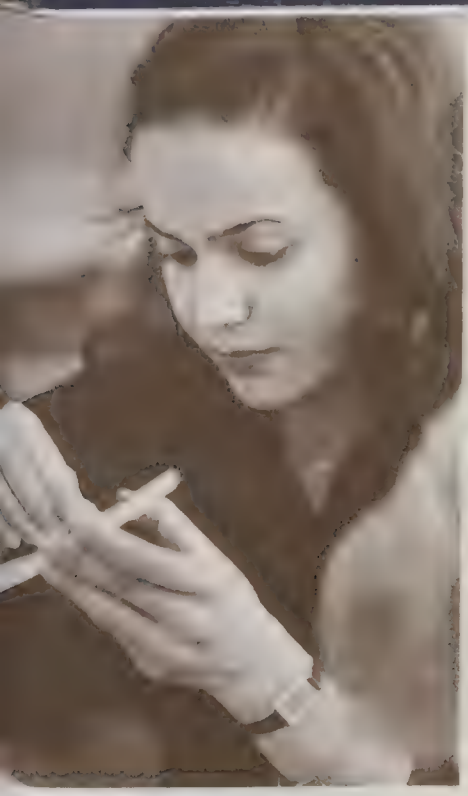
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